Phase Four:
Project Analyses

Final Preliminary Project Report

Total Maximum Daily Loads for Nitrate and Ammonia in Santa Maria River and Oso Flaco Creek watersheds, Santa Barbara and San Luis Obispo Counties, California

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LIST OF ACRONYMS AND ABBREVIATIONS

CEQA	California Environmental Quality Act
CCAMP	Central Coast Ambient Monitoring Program
GIS	Geographic Information System
MEP	Maximum Extent Practicable
MRLC	Multi-Resolution Land Characterization
MS4s	Municipal Separate Storm Sewer Systems
MUN	Municipal and domestic water supply
NPDES	National Pollutant Discharge Elimination System
NH_3	Unionized ammonia
NH_{4+}	Ammonium
QAPP	Quality Assurance Project Plan
SBFCD	Santa Barbara Flood Control District
TMDLs	Total Maximum Daily Loads
USACE	United States Army Corps of Engineers
US EPA	United States Environmental Protection Agency
USGS	United States Geologic Survey
Water Board	Central Coast Water Quality Control Board (Region 3)
WDR	Waste Discharge Requirements
WWTP	Waste Water Treatment Plant

1. PROJECT DEFINITION

This report addresses nitrate impairment of Oso Flaco Lake, Oso Flaco Creek and its tributary, Little Oso Flaco Creek, and the Santa Maria River and its tributaries, Main Street Canal, Bradley Channel, Bradley Canyon Creek, and Orcutt-Solomon Creek. Each of these water bodies, with the exception of Little Oso Flaco Creek, is specifically identified or proposed to be included on the 303(d) list for nitrate.

In October 2006, Water Board staff determined that proposed ammonia listings should be addressed simultaneously with the nitrate listings. As such, this report also addresses the ammonia impairment of Oso Flaco Creek, and the Santa Maria River and its tributaries, Main Street Canal, Blosser Channel, Bradley Canyon Creek, and Orcutt-Solomon Creek.

This report was prepared in the context of numerous existing efforts occurring on multiple land uses and regulatory mechanisms aimed at reducing nitrate and ammonia loading.

This report represents the final deliverable for Phase 4 of the Process for Addressing Impaired Waters in California (June 2005). The information contained in this report will be used as the foundation for development of a Draft Project Report, a deliverable in Phase 5 of the process.

2. WATERSHED DESCRIPTION

The Santa Maria and Oso Flaco watersheds are located in Northwestern Santa Barbara County and Southwestern San Luis Obispo County, California. The watersheds are about 50 miles north of Point Conception and about 150 miles south of Monterey Bay on the central California coast. The climate is mild with 14 inches average rainfall a year.

The area is a broad alluvial plain near the ocean, tapering gradually inland. Upland or mesa areas, foothills, and mountain complexes further define the alluvial plain boundary.

The following information was taken from the Santa Maria Estuary Enhancement Plan (SMEEP, March, 2004):

> The Guadalupe-Nipomo Dunes complex, located approximately 40 miles north of Point Conception, is one of the most extensive coastal dune and dune wetland habitats in the nation. The Santa Maria River is one of the largest rivers on the central coast of California (between Point Lobos and Point Conception), and it begins at the confluence of the Cuyama and Sisquoc rivers. The Santa Maria River flows through the dunes complex and forms the estuary at its mouth. Portions of the upper Sisquoc River, from its origin in the Los Padres National Forest boundary, was designated as wild and scenic (Public Law 90-542, 16 U.S.C. 1271-1287, as amended) in 1992. Other major tributaries that contribute to the Santa Maria or Sisquoc River include La Brea Creek, Tepusquet Creek, and Foxen Creek that flow into the Sisquoc River, and Nipomo Creek, Suey

Creek, and Solomon-Orcutt Creek that flow into the Santa Maria River. Huasna Creek and Alamo Creek also flow into the Cuyama River upstream from Twitchell Reservoir.

Downstream of Highway 1 the Santa Maria River flows freely in the natural riverbed and the channel is bordered by extensive stands of riparian vegetation (dominated by willows) in some areas, and earthen agricultural levees adjacent to cultivated fields and urbanized portions of the City of Guadalupe on the southern high river terrace. Levees in the study reach were constructed for the purpose of protecting bottomland fields from flood flows and were constructed by individual landowners rather than by the U.S. Army Corps of Engineers (USACE) or the Santa Barbara Flood Control District (SBFCD).

Upstream of Highway 1 the Santa Maria River is physically constrained by earthen and rock levees that were constructed by the USACE in the 1950s to protect the City of Santa Maria and adjacent agricultural lands from flooding. Flows from the Cuyama River are regulated by Twitchell Dam, which was also constructed by the Bureau of Reclamation in the 1950s as part of the comprehensive Santa Maria Flood Control Project. Twitchell Dam functions both as a water conservation and flood control facility. The USACE levees extend from Fugler Point (near the town of Garey) and terminate at the upstream side of the Highway 1 Bridge in the City of Guadalupe.

The Santa Maria River exhibits substantial variability in its hydrology and biology. Upstream of Highway 1, the river is dry for most of the year, flowing intermittently in a braided pattern during and shortly after rainfall events, and during releases from Twitchell Dam[1]. Riparian vegetation in this reach is comprised primarily of willows, mulefat, with mock heather, coyote brush, other coastal scrub species on higher terraces, and weeds; vegetation is not contiguous and is absent in some reaches along the levees and in the scour zones. Downstream from Highway 1, shallow surface water is almost always present and riparian vegetation is more prevalent, in some places forming a wide, dense riparian corridor. Flows observed during the dry season above Highway 1 are largely a result of agricultural or urban runoff, and releases from Twitchell Dam that are conducted for the purpose of recharging the Santa Maria groundwater basin. Alternatively, flows observed downstream from Highway 1 during the dry season are due primarily to agricultural and urban runoff, as well as emergence of subsurface flow. A significant source of water into the estuary is Solomon-Orcutt Creek, which drains a primarily agricultural area as well as the community of Orcutt for a watershed area of approximately 50,000 acres.

The Santa Maria Valley groundwater basin extends south from the Nipomo Mesa to the Orcutt Uplands. The Santa Maria groundwater basin is divided into five sub-basins: the

1 The purpose of the releases from Twitchell Dam is to recharge the Santa Maria groundwater basin. During dry periods of the year, water is released at a rate to ensure percolation occurs upstream of the Bonita School Road crossing (Santa Maria Valley Water Conservation District).

Santa Maria, Orcutt, Nipomo, and Upper and Lower Guadalupe sub-basins. The Upper Guadalupe sub-basin constitutes the upper unconfined portion of the sub-basin and the Lower-Guadalupe is a deeper confined aquifer separated from the upper sub-basin by clay layers. Coarse-grained alluvial channel deposits in the river grade to finer silt and clay flood deposits as distance from the river channel increases.

The groundwater system supplies most of the area's water supplies, and is closely related to the impairments. Water Board staff found that groundwater nitrate concentrations in portions of Santa Maria River and other subwatersheds were substantially elevated, with numerous sites consistently exceeding the water quality objective. Irrigated agricultural growers often irrigate with groundwater that has elevated nitrate levels. The origins (e.g. fertilizer, sewage) of the elevated nitrate levels throughout the project area are uncertain. Furthermore, the impacts of the degraded groundwater to the listed water bodies were not fully understood.

The land uses are a mosaic of open space including rangeland, irrigated agriculture, and urban areas. Major watersheds are shown in Figure 1.

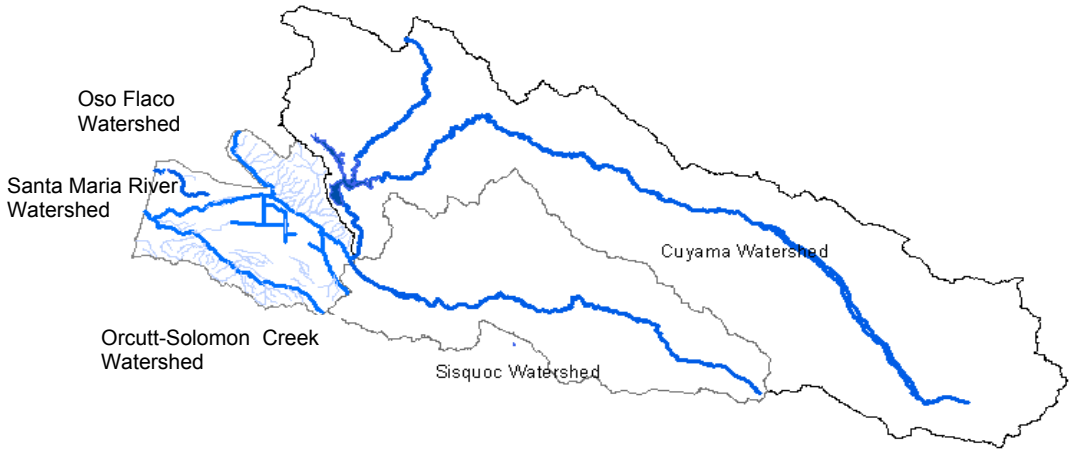

Figure 1. Major watersheds in the project area.

2.1. Beneficial Uses

The Central Coast Regional Water Quality Control Board (Water Board) is responsible for protecting water resources from pollution and nuisance that may occur as a result of waste discharges. The Water Board determines beneficial uses that need protection and adopts water quality objectives that are necessary to protect the beneficial water uses in the *Water Quality Control Plan* (Basin Plan).

The beneficial uses associated with drinking water and irrigation water for sensitive crops are the principal water quality considerations with respect to nitrate. Elevated levels of

nitrate are unsafe for municipal and drinking water supply (MUN) uses. Elevated levels of unionized ammonia also impair beneficial uses (toxicity to aquatic life).

The Basin Plan specifically identifies beneficial uses for some of the listed water bodies included in this analysis. The Santa Maria River, Orcutt Creek, and Oso Flaco Creek have designated beneficial uses in the Basin Plan. The beneficial uses cited in the Basin Plan are listed in Table 1. Water Board staff interpreted Orcutt Creek as being synonymous with Orcutt-Solomon Creek.

The Basin Plan states surface water bodies within the Region that do not have beneficial uses designated for them are assigned the beneficial uses of "municipal and domestic water supply" and "protection of both recreation and aquatic life." Water Board staff interpreted this general statement of beneficial uses to encompass the specific beneficial uses of water contact and non-contact recreation, municipal and domestic supply, and warm fresh water habitat. Main Street Canal, Blosser and Bradley Channels, Bradley Canyon Creek, and Little Oso Flaco Creek are not specifically listed in the Basin Plan and therefore are designated with those beneficial uses.

Beneficial uses are specifically identified for Oso Flaco Lake in the Basin Plan however, municipal and domestic supply is not one of its designated uses. As such, Water Board staff proposed that Oso Flaco Lake be removed from the 303(d) list of impaired water bodies (for nitrate) as part of the 2006 list update. However, this water body was not removed from the list when the list was approved by the State Water Resources Control Board in October 2006 or the US Environmental Protection Agency in December 2006. Water Board staff will review this listing and is likely to recommend removing this waterbody from the list when the list is updated in April 2008.

Table 1. Designated Beneficial Uses for Santa Maria River and Oso Flaco Water Bodies from the Basin Plan.

Water body	Santa Maria River	Orcutt Creek	Oso Flaco Creek	Oso Flaco Lake
Municipal and Domestic Supply (MUN).	X	X	X	
Agricultural Supply (AGR)	X	X	X	
Industrial Process Supply (PROC)				
Industrial Service Supply (IND)	X			
Ground Water Recharge (GWR)	X	X	X	X
Water Contact Recreation (REC-1)	X	X	X	X
Non-Contact Water Recreation (REC-2)	X	X	X	X
Wildlife Habitat (WILD)	X	X	X	X
Cold Fresh Water Habitat (COLD)	X	X		
Warm Fresh Water Habitat (WARM)	X		X	X
Migration of Aquatic Organisms (MIGR)	X			
Spawning, Reproduction, and/or Early Development (SPWN)				X
Preservation of Biological Habitats of Special Significance (BIOL)			X	X
Rare, Threatened, or Endangered Species (RARE)	X	X	X	X
Estuarine Habitat (EST)		X		
Freshwater Replenishment (FRSH)	X	X	X	
Navigation (NAV)				X
Hydropower Generation (POW)				
Commercial and Sport Fishing (COMM)	X	X	X	X
Aquaculture (AQUA)				
Inland Saline Water Habitat (SAL)				
Shellfish Harvesting (SHELL)				

2.2. Water Quality Objectives

The water quality objectives in the Basin Plan that directly apply to the TMDLs are as follows:

- The municipal drinking water supply beneficial use is protected by the numeric water quality objective of 10 mg/L maximum for nitrate (as N).

- The general water quality objective for toxicity includes a maximum concentration of 0.025 mg/L for unionized ammonia (NH_3).

Nitrate levels suitable for municipal drinking water supply may also be toxic to aquatic life. As such, Water Board staff will evaluate the appropriateness of including a numeric criterion for nitrate to meet this general objective for toxicity and include this in the Draft Project Report. Water Board staff will also evaluate whether surface water may be

affecting the beneficial uses of groundwater and establish numeric targets for the surface water accordingly. Results of these evaluations will be included in the Draft Project Report.

2.3. Waste Discharge Prohibitions

The Water Board can prohibit specific types of discharges to certain areas (California Porter-Cologne Water Quality Control Act Section 13243). These discharge prohibitions may be revised, rescinded, or adopted as necessary. Discharge prohibitions are described in pertinent sections of Chapter Four, "Implementation Plan" and Chapter Five, "Plans and Policies" in the Regional Board Discharge Prohibition Section.

The following information is contained in the Basin Plan, and relates to the TMDLs:

Waste discharges to the following inland waters are prohibited: Santa Maria River downstream from the Highway One bridge.

Water Board staff will further evaluate sources within the discharge prohibition zone to determine if allocations are necessary as part of preparing the Draft Report. If sources of nitrate or ammonia are found, then Water Board staff may need to modify the existing prohibition or establish regulatory requirements for dischargers to comply with the prohibition.

2.4. Problem Statement

Oso Flaco Creek, the Santa Maria River and listed tributaries and drainages are identified on the 2002 Clean Water Act (CWA) Section 303(d) List of Water Quality Limited Segments (the 303(d) list) or are proposed to be included on the 2006 303(d) list because nitrate and unionized ammonia levels exceeded municipal drinking water supply water quality objectives. Water Board staff is further evaluating impacts to the more sensitive beneficial uses (e.g. aquatic life) and will include this in the Draft Project Report.

Water Board staff previously used water quality data collected by the Central Coast Ambient Monitoring Program (CCAMP) to recommend inclusion on the 303(d) list. The results of CCAMP data collection, along with additional data collected in these watersheds are discussed in Section 4 Data Analysis. Table 2 shows water bodies identified and/or proposed to be identified as impaired on the 303(d) list. Water Board staff proposes TMDLs be developed for the water bodies as shown.

Table 2. Water bodies Included or Proposed on the 303(d) List.

Water body / Pollutant	Nitrate	Unionized Ammonia
Bradley Canyon Creek	**P**	**P**
Bradley Channel	**P**	
Blosser Channel		**T**
Main Street Canal	**I**	**P**
Santa Maria River	**I**	**P**
Orcutt (Solomon) Creek	**I**	**P**
Oso Flaco Creek	**I**	**P**
Little Oso Flaco Creek	**T**	
Oso Flaco Lake	**D**	

I = Included on 2002 list and needs TMDLs
P = Proposed on draft 2006 list and needs TMDLs
T = Not Identified or Proposed on list but needs TMDLs
D = Identified on list, but does not need TMDLs (proposed delist)

3. NUMERIC TARGET

The municipal drinking water supply beneficial use is protected by the numeric water quality objective of 10 mg/l-N maximum for nitrate. The general water quality objective for toxicity includes a maximum concentration of 0.025 mg/L for unionized ammonia (NH_3).

The proposed numeric targets for this project are consistent with these water quality objectives.

Water Board staff is further evaluating impacts to the more sensitive beneficial uses (e.g. toxicity to aquatic life) and will include numeric targets in the Draft Project Report for these beneficial uses if appropriate.

4. DATA ANALYSIS

4.1. Water Quality Data Analysis

Water Board staff relied on data collected by the following entities or programs in preparing this report:

4.1.1. Central Coast Ambient Monitoring Program (CCAMP)
4.1.2. City of Santa Maria Storm Water
4.1.3. Orcutt-Solomon Creek storm event monitoring
4.1.4. Oso Flaco Nitrate Study
4.1.5. Cachuma Resource Conservation District Report
4.1.6. Santa Maria Estuary Enhancement and Management Plan
4.1.7. Case Study: Rangeland Management Measure Implementation Monitoring
4.1.8. Wastewater Treatment Plant Monitoring
4.1.9. Santa Maria Sanitary Landfill
4.1.10. Santa Maria Valley Groundwater Basin Data
4.1.11. Department of Health Services Groundwater Data
4.1.12. Santa Maria Basin Oil Field Assessment
4.1.13. Santa Maria Oil Refinery
4.1.14. Agricultural groundwater and field runoff monitoring
4.1.15. Conditional Agricultural Waiver Program's Cooperative Monitoring Program

The following discussion summarizes the water quality monitoring activities and results, along with preliminary conclusions regarding sources. Water Board staff also evaluated flow data collected as part of many of these and other efforts; the results are discussed in Section 4.2 Flow Data. Results of a land use analysis are discussed in 4.3 Land Use Data.

4.1.1. Central Coast Ambient Monitoring Program

The Water Board's Central Coast Ambient Monitoring Program (CCAMP) conducted monthly nitrate and total ammonia monitoring in 2000 and 2001. Monthly water quality monitoring continued at the Santa Maria River site at Rancho Guadalupe Dunes Preserve through March 2003 and January 2004 - present. Water Board's CCAMP staff will be collecting additional data in 2007-08 at all sites in the Santa Maria and Oso Flaco watersheds. This information will be incorporated into the Final Project Report. CCAMP staff calculated values of unionized ammonia from total ammonia laboratory results and field measurements of pH and temperature.

Figure 2 and Figure 3 show the major water bodies and monitoring stations of the upper and lower Santa Maria and Oso Flaco watersheds, respectively. Little Oso Flaco Creek (Shown but not identified in Figure 3) drains to Oso Flaco Creek from the East. Main Street Canal, Bradley Channel, Blosser Channel, and Bradley Canyon Creek (also not identified in Figure 3) flow into the Santa Maria River from the south. Table 3 shows the names of the sampling sites.

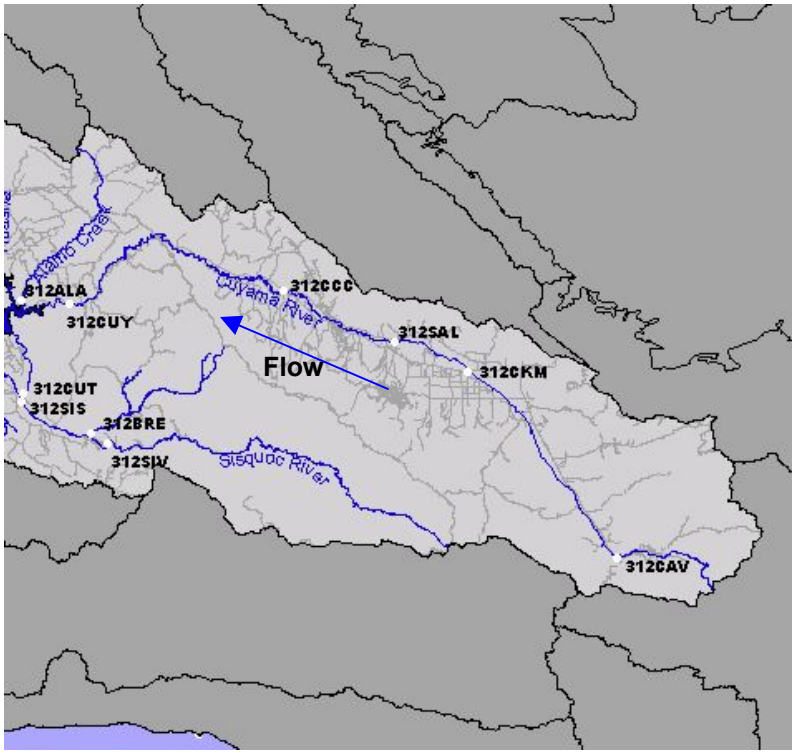

Figure 2. Major Water Bodies and CCAMP Monitoring Locations in the Upper Santa Maria Watershed.

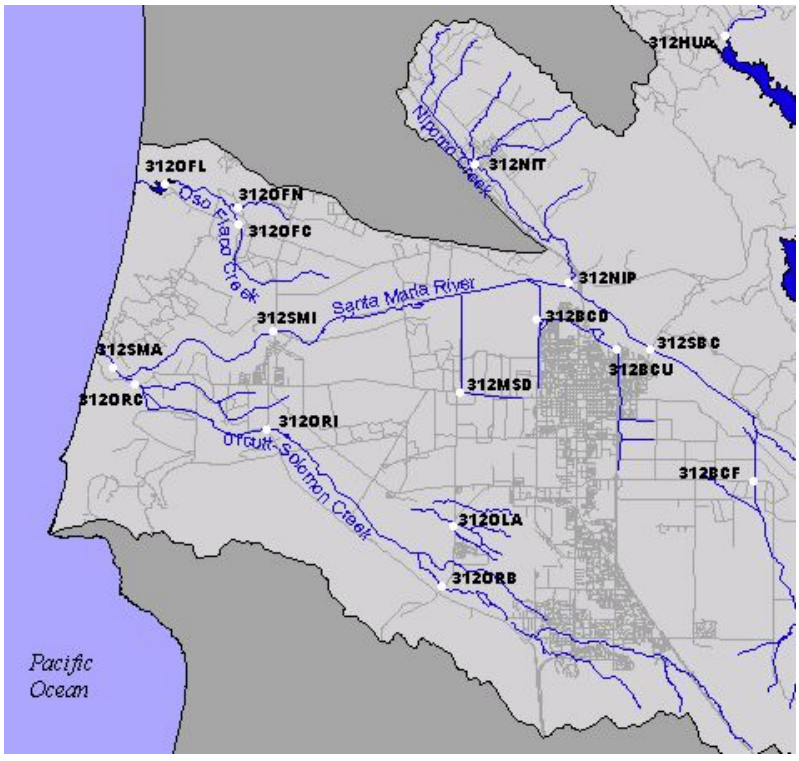

Figure 3. Major Water Bodies and CCAMP Monitoring Locations in the Lower Santa Maria Watershed and in the Oso Flaco Watershed.

Table 3. CCAMP Monitoring Locations in the Santa Maria And Oso Flaco Watersheds.

Water body	Site name	Site location
Alamo Creek	312ALA	312ALA-Alamo Creek at Alamo Creek Road
Blosser Channel	312BCD	312BCD-Blosser Channel d/s of groundwater recharge ponds
Bradley Canyon Creek	312BCF	312BCF-Bradley Canyon diversion channel @ Foxen Canyon Road
Bradley Channel	312BCU	312BCU-Bradley Channel u/s of ponds @ Magellan Drive
LaBrea Creek	312BRE	312BRE-LaBrea Creek u/s Sisquoc River
Cuyama River (above res.)	312CAV	312CAV-Cuyama River @ Highway 33
Cuyama River (above res.)	312CCC	312CCC-Cuyama River d/s Cottonwood Canyon
Cuyama River (above res.)	312CUL	312CUL-Cuyama River above Lockwood turnoff
Cuyama River (below res.)	312CUT	312CUT-Cuyama River below Twitchell @ White Rock Lane
Cuyama River (above res.)	312CUY	312CUY-Cuyama River d/s Buckhorn Road
Huasna River	312HUA	312HUA-Husana River @ Huasna Townsite Road
Main Street Canal	312MSD	312MSD-Main Street Canal u/s Ray Road @ Highway 166
Nipomo Creek	312NIP	312NIP-Nipomo Creek @ Highway 166
Nipomo Creek	312NIT	312NIT-Nipomo Creek @ Tefft Street
Oso Flaco Creek	312OFC	312OFC-Oso Flaco Creek @ Oso Flaco Lake Road
Oso Flaco Lake	312OFL	312OFL-Oso Flaco Lake @ culvert
Little Oso Flaco Creek	312OFN	312OFN-Little Oso Flaco Creek
Betteravia Lakes	312OLA	312OLA-Betteravia Lakes at Black Road
Orcutt Solomon Creek	312ORB	312ORB-Orcutt Solomon Creek @ Black Road
Orcutt Solomon Creek	312ORC	312ORC-Orcutt Solomon Creek u/s Santa Maria River
Orcutt Solomon Creek	312ORI	312ORI-Orcutt Solomon Creek @ Highway 1
Salisbury Creek	312SAL	312SAL-Salisbury Creek @ Branch Canyon Wash
Santa Maria River	312SBC	312SBC-Santa Maria River @ Bull Canyon Road
Sisquoc River	312SIS	312SIS-Sisquoc River @ Santa Maria Way
Sisquoc River	312SIV	312SIV-Sisquoc River u/s Tepusquet Road
Santa Maria River	312SMA	312SMA-Santa Maria River @ Rancho Guadalupe Dunes Preserve
Santa Maria River	312SMI	312SMI-Santa Maria River @ Highway 1

Water Board staff evaluated water quality data collected by CCAMP to determine where water quality objectives were exceeded. Figure 4 and Figure 5 show the mean and range of nitrate and unionized ammonia data collected at each CCAMP site in the Santa Maria hydrologic unit area. Sites are displayed in order of decreasing mean.

Water Board staff determined the Santa Maria River (312SMA, 312SMI), Main Street Canal (312MSD), Bradley Channel (312BCU), Bradley Canyon Creek (312BCF), Orcutt-Solomon Creek (312ORI, 312ORC, 312ORB), Oso Flaco Creek, Little Oso Flaco Creek and Oso Flaco Lake (312OFC, 312OFN, 312OFL) exceeded the maximum concentration 10 mg/L nitrate-N. Water Board staff determined the Santa Maria River (312SMI), Main Street Canal (312MSD), Bradley Canyon Creek (312BCF), Blosser

Channel (312BCD), Orcutt-Solomon Creek (312ORB, 312ORI) and Oso Flaco Creek (312ORC), exceeded the general water quality objective for unionized ammonia. Table 4. includes summary statistics of CCAMP data along with the number of exceedances of the existing Basin Plan objective of 0.025 mg/L NH_3 as N for the impaired water bodies.

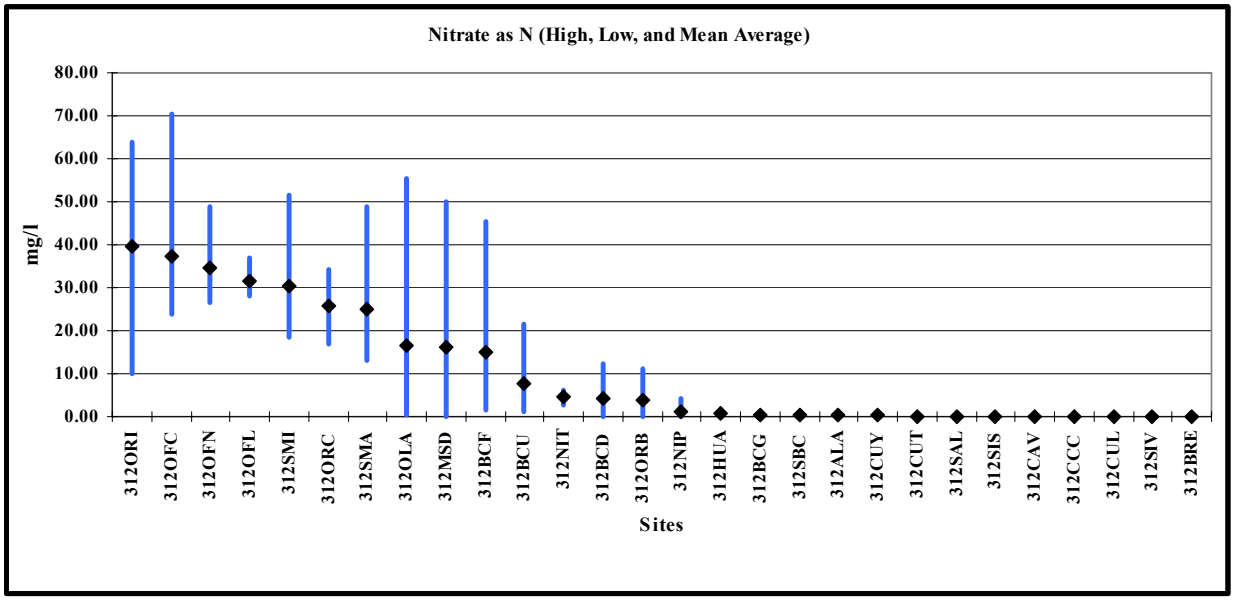

Figure 4. CCAMP Nitrate Concentrations in the Santa Maria And Oso Flaco Watersheds

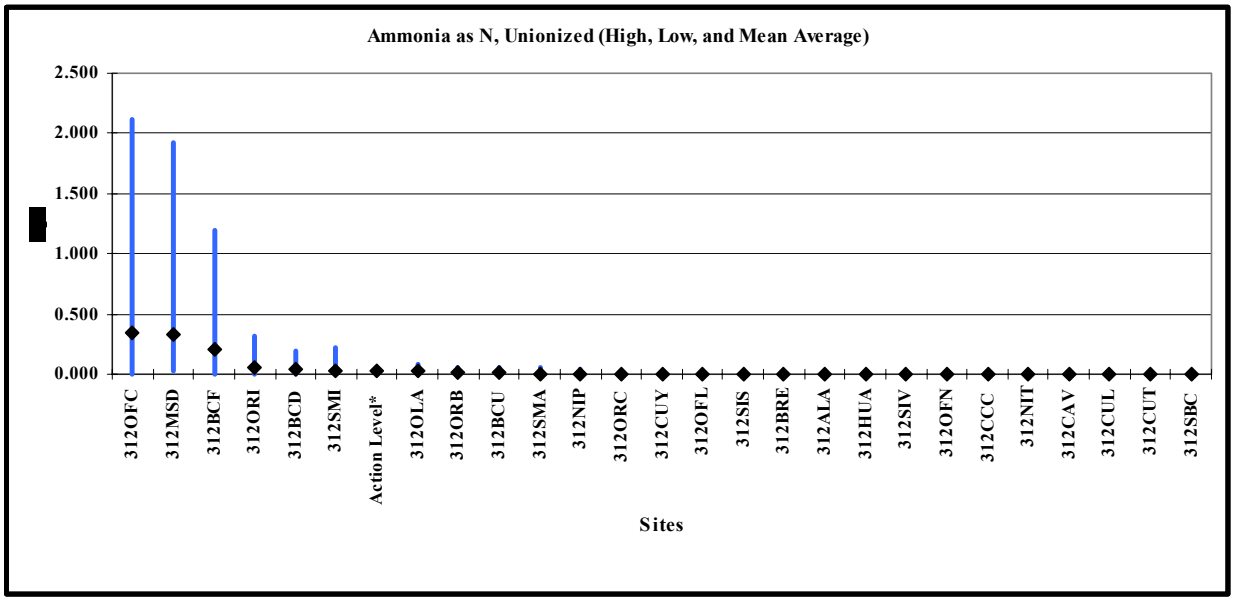

Figure 5. CCAMP Unionized Ammonia Concentrations in the Santa Maria And Oso Flaco Watersheds.

Table 4. Summary Statistics of CCAMP Unionized Ammonia Data.

Water body	Site(s)	Data points exceeding > 0.025 mg/l	Total data points	Data Range (mg/L)
Oso Flaco Creek	(312OFC)	12	13	ND - 14.4
Santa Maria River	(312SMI)	12	13	ND - 4.264
Main Street Canal	(312MSD)	13	13	0.4 - 32.8
Bradley Canyon Creek	(312BCF)	8	8	ND – 27.5
Blosser Channel	(312BCD)	8	8	0.1 – 0.271
Orcutt Solomon Creek	(312ORB, 312ORI)	11, 12	11, 13	ND – 5.002

Santa Maria River and tributaries

CCAMP staff collected samples in the Santa Maria River at Highway 1 (312SMI) and further downstream at Rancho Guadalupe Dunes Preserve Road (312SMA) between January 2000 and February 2001. Sampling at 312SMA is continuous on a monthly basis through CCAMP's Coastal Confluences project; data for this site is shown through May 2005 in Figure 6. The units on the "y" axis of the graph in Figure 6 are mg/L as N.

CCAMP staff also collected samples in Bradley Canyon Creek at Foxen Canyon Road (312BCF); Blosser Channel (312BCD) and Bradley Channel (312BCU), two concrete storm water conveyances; and Main Street Canal upstream of Ray Road at Highway 166 (312MSD), a storm water conveyance and agricultural drainage that flows to percolation ponds and then ultimately to the Santa Maria River.

Blosser Channel drained to the Santa Maria River, and since data collection, was significantly modified in conjunction with adjacent urban development. As such, this water body no longer receives year-round flow from adjacent storm water ponds. Bradley Channel received some runoff from the agricultural areas south of the City of Santa Maria and urban runoff from east of Highway 101 and drained to percolation ponds. Main Street Canal has also recently undergone significant development; the monitoring location has since been buried from the edge of the urban area to where it crosses Main Street.

Concentrations of nitrate found at 312SMI were higher in eleven of sixteen samples and more variable than those found downstream at 312SMA during 2000-01. Elevated nitrate levels at 312SMA continued through 2005. Nitrate concentrations along the Santa Maria River appear to be higher during the dry season, although exceedances were found during every month of the year.

CCAMP monitoring of storm water channels in the City of Santa Maria between January 2000 and March 2001 (not graphed) indicated some elevated nitrate concentrations. Bradley Channel had three of fifteen samples exceeding the nitrate water quality objective for drinking water. Nitrate levels were also elevated at Bradley Canyon Creek at Foxen Canyon Road (312BCF) and Bradley Channel (312BCU).

Concentrations at the Main Street Canal (312MSD) were lower than those found in the Santa Maria River, but were still elevated above the nitrate water quality objective during numerous samples (eight of fourteen) collected throughout the year.

Concentrations of unionized ammonia at Highway 1 (312SMI) were consistently elevated above the general water quality objective between January 2000 and March 2001 (not graphed). Concentrations downstream at 312SMA were within water quality objectives. As shown previously in Table 4, unionized ammonia levels were elevated year-round at Main Street Canal (312MSD), Bradley Canyon Creek at Foxen Canyon Road (312BCF), and Blosser Channel (312BCD).

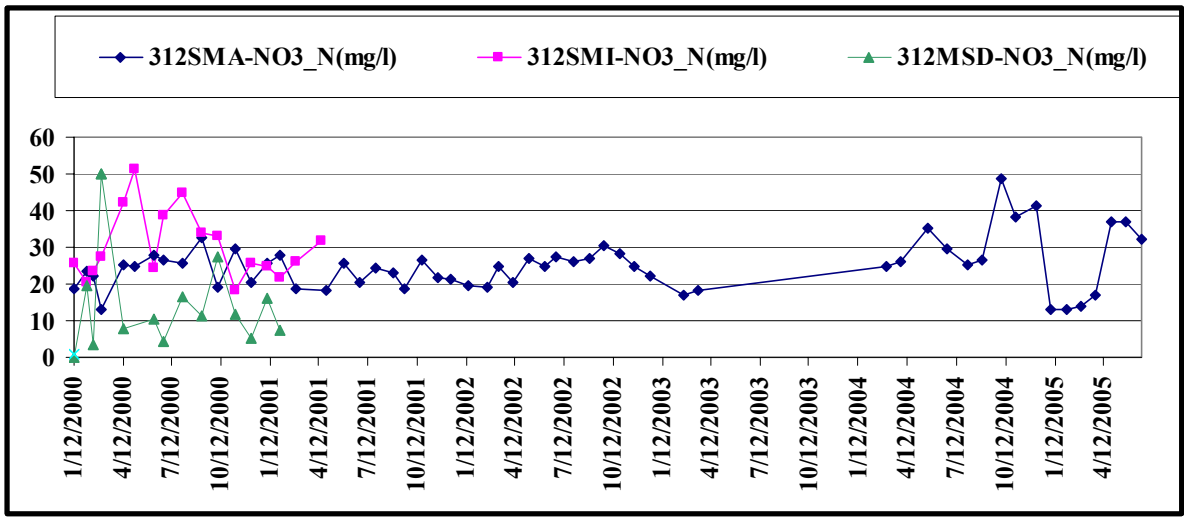

Figure 6. Nitrate Concentrations in The Santa Maria River At Highway 1 (312SMI), Santa Maria River At Rancho Guadalupe Dunes Preserve Road (312SMA), And Main Street Canal (312MSD) January 2000 To May 2005.

CCAMP staff collected samples at Orcutt-Solomon Creek between January 2000 and March 2001. Nitrate concentrations at three sites are displayed in Figure 7. The units on the "y" axis of the graph are mg/L as N. Orcutt-Solomon Creek at Rancho Guadalupe Dunes Preserve Road (312ORC) is about 500 meters upstream of the creek's confluence with the Santa Maria River.

Nitrate concentrations were higher and more variable at Highway 1 (312ORI), than further downstream at Rancho Guadalupe Dunes Preserve Road (312ORC). Levels exceeded the water quality objective at both 312ORI and 312ORC year-round.

Water Board staff does not consider the most upstream site on Orcutt-Solomon Creek at Black Road (312ORB), a low flowing drainage, as impaired, as it exhibited low nitrate levels year-round. CCAMP staff collected data at Betteravia Lakes at Black Road (312OLA), but did not consider the data to be representative due to lack of flow. As such, data from 312OLA are not shown in Figure 7.

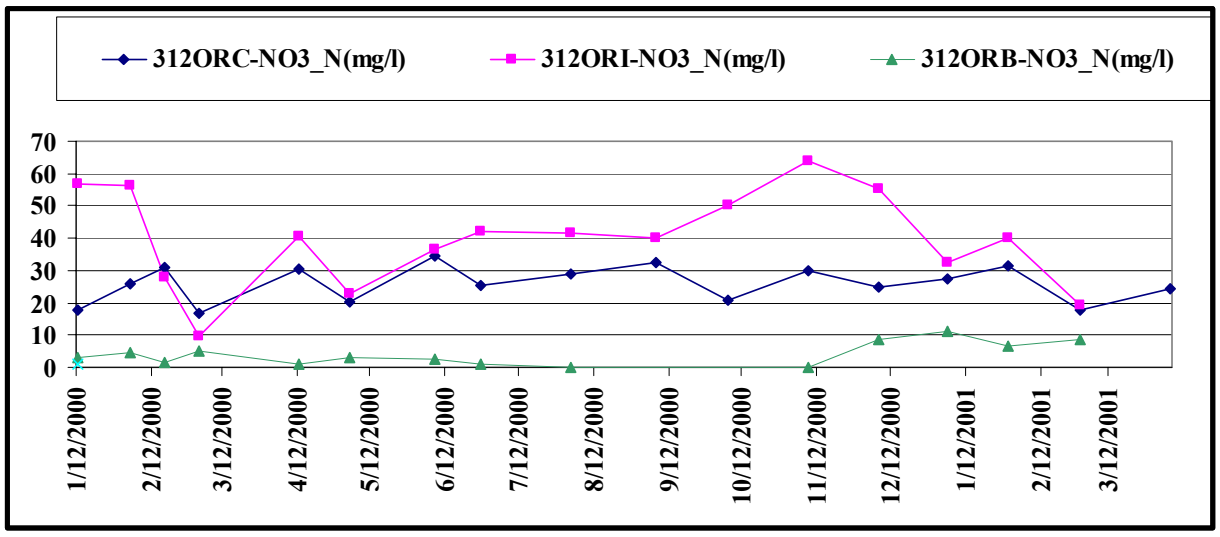

Figure 7. Nitrate Concentrations in Orcutt-Solomon Creek at 312ORC, 312ORI, and 312ORB, January 2000 to March 2001.

Unionized ammonia concentrations were higher at Highway 1 (312ORI), than further upstream at 312ORB. Levels exceeded the water quality objective at both 312ORI and 312ORB year-round. Concentrations of unionized ammonia at 312OR1 and 312ORB are shown in Figure 8.

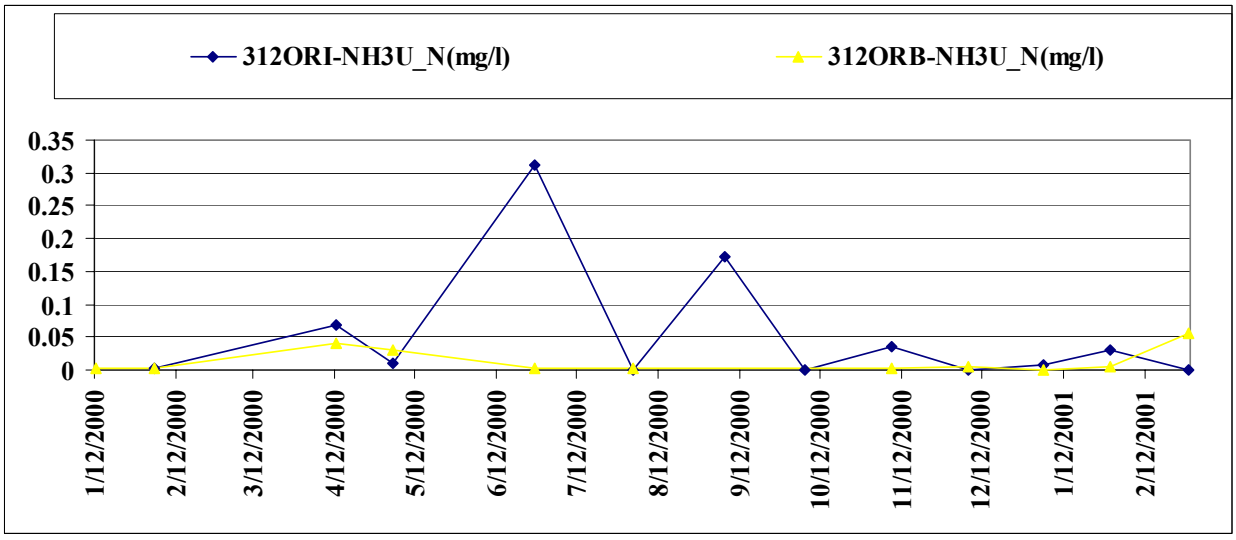

Figure 8. Unionized Ammonia Concentrations in Orcutt-Solomon Creek at 312ORI and 312ORB, January 2000 to March 2001.

Oso Flaco Creek Watershed

CCAMP staff collected samples in the Oso Flaco watershed between January 2000 and April 2001. Nitrate concentrations are displayed in Figure 9. The units on the "y" axis of the graph are mg/L as N. Nitrate concentrations at all sites were elevated above water quality objectives year round. Concentrations at Oso Flaco Creek at Oso Flaco Creek Road (312OFC) were more variable than those measured at Little Oso Flaco Creek (312OFN) and Downstream at Oso Flaco Lake (312OFL).

Little Oso Flaco Creek is not specifically listed as impaired on the 303(d) list. Water Board staff concluded that both Oso Flaco Creek and its tributary, Little Oso Flaco Creek were impaired for nitrate. As such, TMDLs will be developed for both water bodies. Oso Flaco Lake is on the 303(d) list, but is not designated as supporting the municipal use and as such, Water Board staff will not develop a nitrate TMDL for this water body unless it is concluded that a numeric target and TMDL for nitrate toxicity to aquatic life is warranted.

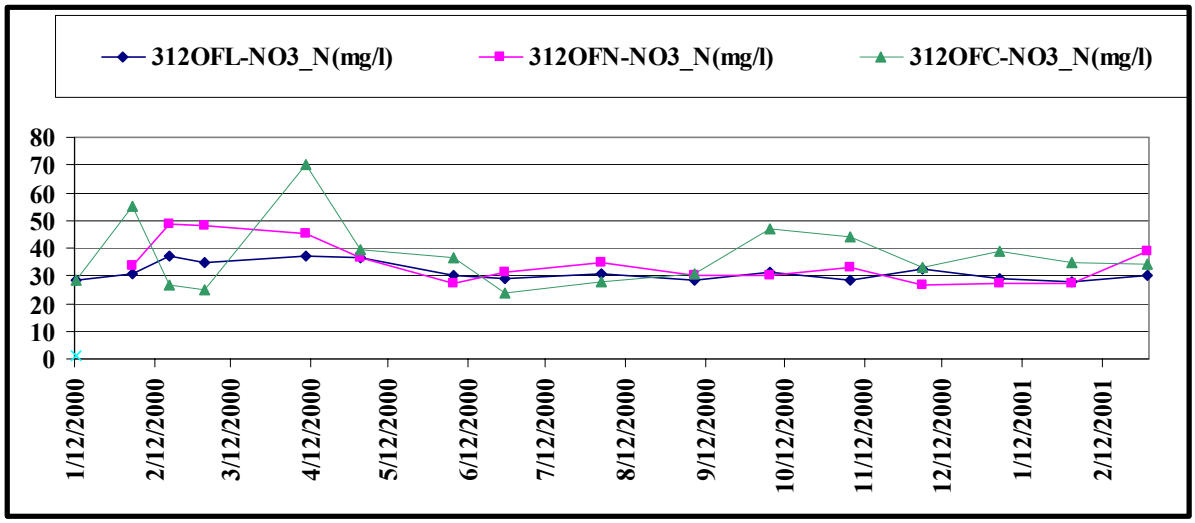

Figure 9. Nitrate Concentrations in the Oso Flaco Watershed, January 2000 To March 2001.

Unionized ammonia concentrations at Oso Flaco Creek at Oso Flaco Creek Road (312OFC) were elevated above water quality objectives year round (Figure 10). Neither Oso Flaco Lake nor Little Oso Flaco Creek were impaired for unionized ammonia.

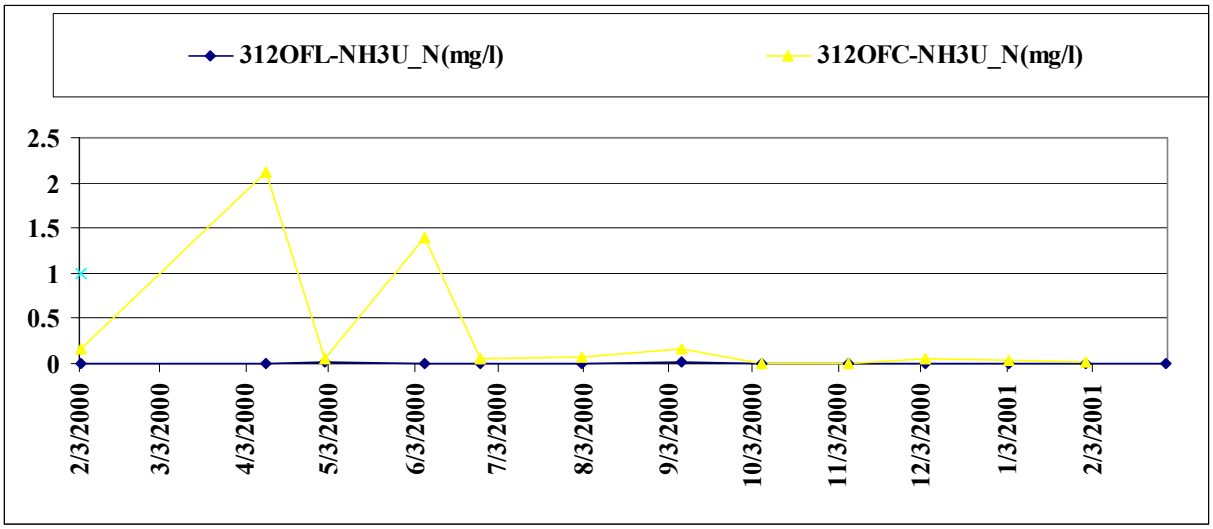

Figure 10. Unionized Ammonia Concentrations in the Oso Flaco Watershed, February 2000 to March 2001.

4.1.2. City of Santa Maria Storm Water Monitoring

The Water Board will be regulating storm water through approval of Storm Water Management Plans that comply with the National Pollution Discharge Elimination General Permit (NPDES) for discharges (Permit No. CAS000004, Order No. 2003-0005-DWQ). The municipalities in the Santa Maria and Oso Flaco watersheds must obtain approval of these plans and comply with the general permit. Some municipalities are monitoring surface and runoff quality as part of their proposed permit activities.

The City of Santa Maria began collecting data during storm events in 2004. City of Santa Maria staff chose monitoring stations to characterize land use contributions. Prell Basin primarily collected storm water from agricultural areas to the West and was representative of flows which entered the City of Santa Maria. Hobbs Basin collected urban runoff and during overflows, discharged to a channel along Stowell Road and eventually flowed to the Santa Maria River. This sample site was representative of urban flows leaving the City of Santa Maria. The Main Street Channel consisted of two channels that ran on along Main Street and combined to become the Unit 2. Ditch, and discharged to the Santa Maria River. This site represented mixed contributions from urban and agricultural areas, with the North Channel of the Main Street Canal receiving more agricultural inputs. City of Santa Maria staff plans to continue storm water monitoring efforts indefinitely, with a minimum of three sampling events per wet season. Water Board staff is currently performing quality assurance evaluation of the data and will include the final data in the Draft Report. Additional sampling will provide further information to characterize urban and agricultural inputs. Water Board staff concluded that urban runoff is a source of nitrate and unionized ammonia.

Figure 11, Figure 12 and Figure 13 show the monitoring locations. Table 5 shows a summary of concentrations collected between 2004 and 2006. Nitrate levels in the North Channel of the Main Street Canal were higher (37 mg/L as N) than those measured elsewhere. Nitrate concentrations measured in storm water runoff from Prell and Hobbs Basins and the South Channel of Main Street did not exceed water quality objectives. Ammonia levels exceeded objectives at Prell Basin and Main Street (North and South).

Figure 11. Location of the Prell Basin Sampling Station within the City Of Santa Maria.

Figure 12. Location of the Hobbs Basin Sampling Station within the City Of Santa Maria.

Figure 13. Location of the Main St. Channel North and South Sampling Stations within the City Of Santa Maria.

Table 5. Summary of Nitrate (mg/L as N) and Ammonia Concentrations Collected by the City of Santa Maria.

Station	Nitrate Min	Nitrate Average	Nitrate Max	Unionized Ammonia Min	Unionized Ammonia Average	Unionized Ammonia Max
Prell Basin	2.7	3.2	3.7	ND	0.2	0.5
Hobbs Basin	ND	1.3	1.8	ND	ND	ND
Main St. North	2.2	14.2	37.0	ND	4.6	20.0
Main St. South	1.0	2.3	5.9	ND	0.1	0.4

4.1.3. Orcutt-Solomon Creek storm event monitoring

Santa Barbara County's Project Clean Water sponsors studies to help identify pollution sources and develop an understanding of how those pollutants move through the environment. Project Clean Water staff conducted nitrate and ammonical nitrogen in Orcutt-Solomon Creek during four storm events at Black Road, monitoring site OR1 and at an upstream location, OR5. OR1 is the same location as CCAMP monitoring site 312ORB. Figure 14 shows the monitoring locations. Table 6 displays summary nitrate and ammonical nitrogen values.

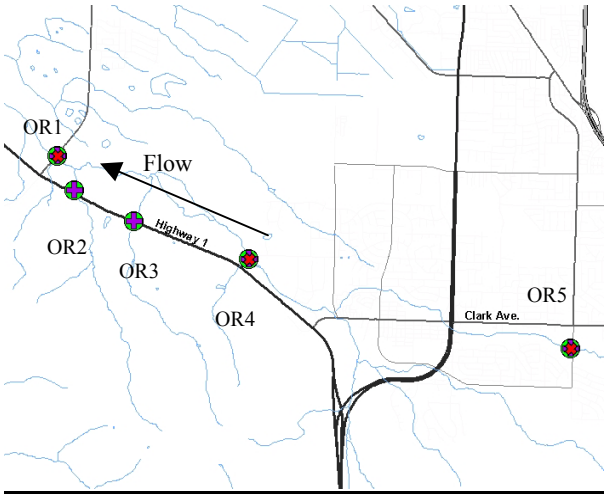

Figure 14. Project Clean Water Sampling Sites on Orcutt-Solomon Creek.

Table 6. Summary of Nitrate (as N) and Ammonical Nitrogen Concentrations Collected by Project Clean Water.

Station	Number of Samples	Time period	Nitrate (mg/L) Min.	Nitrate (mg/L) Average	Nitrate (mg/L) Max	Number of Samples	Time period	Ammonical Nitrogen (mg/L) Min.	Ammonical Nitrogen (mg/L) Average	Ammonical Nitrogen (mg/L) Max
OR1	9	2/2000 - 2/2003	1.5	6.1	10.0	3	11/2002 - 2/2003	ND	0.2	0.5
OR5	7	1/2001 - 2/2003	ND	0.1	0.7	3	11/2002 - 2/2003	ND	0.1	0.2

Nitrate levels at OR1 ranged from 3.7 to 10.0 mg/L. Nitrate levels at OR5 were non-detectable levels of nitrate, with the exception of one sample (0.7 mg/L). No storm water samples exceeded the nitrate water quality objective. Ammonical nitrogen levels at OR1 were higher than those measured at OR5.

4.1.4. Oso Flaco Nitrate Study

The Coastal Conservancy contracted with The Dunes Center to conduct an Oso Flaco Watershed Nitrate and Sediment Assessment. Objectives of the study included developing a nitrate model. As part of this effort, the Cachuma Resources Conservation District (CRCD) collected nitrate data in 2002-2003 at eight locations within the Oso Flaco watershed. Raw data are shown in Table 7 and summarized in Table 8. Urban storm water discharges from the rural residential area of Nipomo Mesa to Oso Flaco watershed did not exceed water quality objectives; runoff did not occur during dry periods. Samples taken from Oso Flaco Creek, and Little Oso Flaco Creek exceeded water quality objectives, but were typically less than samples taken from unnamed agricultural ditches. Irrigated agricultural discharges occurred during both wet and dry seasons.

Table 7. Nitrate (as N) Values from Agricultural Drainage Sites in Oso Flaco Watershed

	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8
	Urban	Bonita/ Division	Division/ Culvert	Highway 1/ OFLRd	RR/OFLRd	Crk/OFLR	LOFC/RR	OFL/ Causeway
06/12/02	2	113	154	77	43	41	18	51
07/10/02	2	96	89	9	12	50	44	38
07/24/02	ns	13	12	25	ns	47	42	37
08/06/02	3	80	34	40	20	25	32	30
08/20/02	ns	120	99	34	ns	36	29	29
09/11/02	ns	63	47	21	38	36	35	32
10/09/02	ns	76	66	44	19	51	41	34
11/13/02	ns	ns	ns	111	56	65	53	40
12/10/02	ns	72	102	10	17	31	38	41
01/15/03	ns	85	101	50	37	65	41	40
02/20/03	ns	ns	ns	ns	ns	34	43	38
03/11/03	ns	61	108	34	15	29	38	29
04/29/03	ns	65	ns	ns	ns	29	38	29
05/29/03	ns	89	95	11	20	41	47	50
06/30/03	ns	137	ns	86	40	65	76	52
Average	2	82	82	42	29	43	41	38

ns: no sample taken

Table 8. CRCD Monitoring Locations and Data Summary in the Oso Flaco Watershed.

Station (s)	Primary land use/location within drainage area	No.	Min. (mg/L)	Average (mg/L)	Max. (mg/L)
Site 1	Urban runoff from Nipomo Mesa via storm water collection system on Division Road; stagnant flow	3	2	2	3
Site 2	County Road Ditch Culvert Outlet. Intersection of Bonita School Road and Division Rd. West of BSRd, South side of Division.	13	13	82	137
Site 3	Ag Ditch Coming from County Road Ditch Culvert Outlet. North Side of Division Rd. Approximately 4,650 feet west /south west of the split in the road of Division and Oso Flaco Lake Road.	11	12	82	154
Site 4	County Road Ditch. Intersection of Highway 1 and Oso Flaco Lake Road. Southwest Quadrant. West of Highway 1 and south of Oso Flaco Lake Road.	13	9	42	111
Site 5	County Road Ditch along Oso Flaco Lake Road, just west of the railroad tracks. South of Oso Flaco Lake Road.	11	12	26	56
Site 6	Oso Flaco Creek just north of Oso Flaco Lake Road.	15	25	43	65
Site 7	Little Oso Flaco Creek just west of the train trestle.	15	18	41	76
Site 8	At the causeway at Oso Flaco Lake. Downstream end of two culverts.	15	29	38	52

4.1.5. Cachuma Resource Conservation District Report

The CRCD summarized water quality issues in the Santa Maria River in the Santa Maria River Watershed Non-Point Source Pollution Management Plan (CRCD, 2000). This report focused on non-point source pollution including nutrients, and also provided an overview of methods to address water quality degradation and improvement for agricultural and urban uses, and ecological functions. Also included in the CRCD's report was an assessment of the effectiveness, feasibility, and landowner willingness to implement measures to improve water quality, availability of funding sources, and a summary of local, State and Federal permit and California Environmental Quality Act (CEQA) requirements. This report did not contain water quality data.

4.1.6. Santa Maria Estuary Enhancement and Management Plan

The State Coastal Conservancy prepared the Santa Maria Estuary Enhancement and Management Plan (Plan) in March 2004. The Plan identified existing conditions of, and stresses to, the natural resources, recommended enhancement or management measures, suggested alternative land use practices, and developed a comprehensive monitoring program to allow for adaptive resource management and plan element modification over time. The actions described by the Plan were developed with stakeholder input, including interested private landowners and project area lessees, with the understanding that implementation would be voluntary. The Plan acknowledged the benefits of advanced planning and implementation of water quality improvement measures prior to regulatory requirements associated with future TMDLs. The Plan also identified actions (agricultural practices, urban storm water runoff, water quality monitoring) to be considered for the TMDL implementation plan.

Plan development included agricultural outreach interviews (conducted by the Dunes Center) to gather information on cultivated agricultural and cattle grazing practices.

The Plan also included water quality data collection, focused on nitrate inputs. Table 9 provides a data summary for this study; for additional information see reports in the Santa Maria Estuary Enhancement and Management Plan (*SMRE)* Study, Appendix B dated March 12, 2001 and October 23, 2002.

Table 9. Nitrate as N Measurements from the *SMRE* Study

November, 2001[a]	
Sampling location	Nitrate as N (mg/L)
Hwy 1	8.3 - 8.8
Lagoon	18 - 22
May, 2002[b]	
Hwy 1	9.6
8th Street	10.6
Ditch near Kiosk	28.1
Orcutt Creek	20.9
Lagoon	16.2

[a] *Data from 2 daytime samples taken on 10/31 and 11/20, 2001 (MNE Letter Report dated March 12, 2002 (Appendix B).*
[b] *Mean data for 6 samples taken every 6 hours for 36 hours May 22 and 23 (graphs in MNE Letter Report dated October 25, 2002 (Appendix B).*

According to the Plan, the nitrate concentrations measured at Highway 1 were lower than samples collected from the estuary, which was likely due to substantial nutrient input from Orcutt-Solomon Creek combined with the drainage ditch near the kiosk to Rancho Guadalupe Dunes Preserve. Together these sources accounted for about 96% of the nitrate input to the estuary (*SMRE* Study, Appendix B, MNE report dated February 28, 2002).

The Plan also developed a water budget in the estuary and determined it was substantially affected by input from Solomon-Orcutt (Orcutt-Solomon) Creek and the drainage ditch near the kiosk. Combined, these two sources accounted for approximately 92% of the total inflow to the estuary. Water level rises in the estuary following rainfall when the barrier berm has not been breached and the rate of inflow (from upstream) exceeds the length and rate of seepage through the barrier berm to the ocean (about 0.8 cubic m/sec).

4.1.7. Case Study: Rangeland Management Measure Implementation Monitoring

In the Morro Bay watershed study (National Monitoring Program, 2003), Water Board staff collected nitrate data to evaluate the effectiveness of rangeland management practices. The data demonstrated nitrate in the creeks did not significantly change when management practices were implemented. This data suggested that rangeland practices were not a source of nitrate. This information suggested that rangeland is not a significant source of ammonia either.

4.1.8. Wastewater Treatment Plant Monitoring

The Water Board issues Waste Discharge Requirements (WDRs) for several facilities in the Santa Maria and Oso Flaco watersheds. Several of the facilities in the Santa Maria watershed (City of Santa Maria, City of Guadalupe, Laguna County Sanitation District, and Nipomo Community Services District wastewater treatment plants) collect water quality data as part of their permit coverage.

Water Board staff evaluated available effluent, surface and groundwater nitrate data collected by these agencies. The Nipomo Community Services District analyzes samples for total nitrogen rather than for nitrate; staff included this data in the table. A summary of all data is shown in Table 10.

As shown in Table 10, effluent and groundwater concentrations measured by the City of Santa Maria were below water quality objectives. Effluent and groundwater concentrations measured by the City of Guadalupe were below water quality objectives, with the exception of levels measured upgradient of the wastewater spray field, which rose dramatically in 1998. As a result, the Water Board recently required the City of Guadalupe to perform a hydrogeological evaluation of the representative nature of the well and install new one if needed.

Water Board staff evaluated nitrate concentrations measured by the Laguna County Sanitation District in 2003 and 2005. Groundwater concentrations were below 10 mg/l with the exception of one sample collected downgradient in 2005. All effluent samples were below 10 mg/L with the exception of one sample collected in April 2003. Surface water samples collected in Orcutt-Solomon Creek were higher downgradient of the wastewater treatment plant than upgradient.

Nipomo Community Services District Water Board staff is currently evaluating sub-surface flow in order to draw definitive conclusions regarding the impact of effluent percolation to area groundwater.

Water Board staff concluded the wastewater treatment plants were not a significant source of nitrate to the Santa Maria River. Water Board staff is further evaluating whether the discharges are sources causing ammonia impairment in the listed water bodies and will include this in the Draft Project Report.

Table 10. Summary of nitrate (as N) concentrations collected by area WWTPs.

Facility	Period of data reviewed	Sampling frequency and location	n	Min. (mg/L)	Average (mg/L)	Max. (mg/L)
City of Santa Maria	2002-2004	Annual Effluent	3	0.5	4.0	7.9
		Quarterly Groundwater (upgradient)	12	<1.0	n/a [1]	<5.0
		Quarterly Groundwater (downgradient)	24	<0.5	n/a [1]	<5.2
City of Guadalupe	1994-2004	Annual Groundwater (upgradient) 1994-1996	5	<0.1	0.4	1.8
		Annual Groundwater (downgradient) 1994-1996	5	<0.1	0.2	<0.5
		Annual Groundwater (upgradient) 1998-2004	5	100	118	140
		Annual Groundwater (downgradient) 1998-2004	5	<0.1	0.2	0.2
Laguna County Sanitation District	2003; 2005	Annual Groundwater (upgradient)	6	0.2	3.3	9
		Annual Groundwater (downgradient)	6	0.3	4.9	11
		Quarterly Effluent	8	0.1	4.0	18
		Monthly Orcutt-Solomon Creek at Black Rd. (upgradient)	12	<0.1	1.8	8.9
		Monthly Orcutt-Solomon Creek at Brown Rd. (downgradient)	12	2.4	26	45
Nipomo Community Services District	2000-2005	Semi-annual Groundwater [2]	36	1	18	52

1 individual numerical values not available to compute averages

2 parameter measured is Total N

4.1.9. Santa Maria Sanitary Landfill

The Santa Maria Sanitary Landfill is located east of the Santa Maria River and is regulated via the NPDES Industrial Stormwater General Permit. The City of Santa Maria takes annual nitrate samples at two storm water discharge points (SW-1, downstream and SW-2) and surface water samples as part of their industrial storm water monitoring program. Ammonia was not analyzed in surface water samples.

Water Board staff evaluated annual nitrate storm water data collected in between 2001 and 2004. Concentrations in four storm water samples taken from the two sites were variable, with samples averaging 4.2 mg/L as N. All samples were below the nitrate drinking water objective, with the exception of one sample (16 mg/L) taken from the upstream site, SW-2 in 2004. Surface water monitoring also indicates background levels of nitrate.

Water Board staff evaluated annual nitrate surface water data collected in January 2006. Nitrate levels were non-detectable in surface water samples taken from Bradley Channel and the Twitchell Release Point.

Water Board staff concluded the landfill was not a significant source of nitrate to the Santa Maria River. Staff will further evaluate whether the landfill is a source of ammonia to the Santa Maria River and include this in the Draft Project Report.

4.1.10. Santa Maria Valley Groundwater Basin Data

In July 1995, Water Board staff prepared a report documenting nitrate contamination of groundwater between 1951 and 1995. The report included an assessment of specific groundwater basins in the Central Coast Region and concluded the Santa Maria Valley groundwater basin had significant nitrate contamination. The report indicates the presence of several nitrate plumes in the vicinity of Nipomo and Santa Maria, with nitrate levels reaching 13 mg/L and 20 mg/L (as N), respectively. As part of the 1995 report, Water Board staff recommended additional monitoring be conducted to verify trends, and a groundwater nitrate management plan be developed.

4.1.11. Department of Health Services Groundwater Data

Department of Health Services collected groundwater data throughout the region. Figure 15 displays the location of all the groundwater monitoring sites in the Santa Maria and Oso Flaco watersheds. Water Board staff evaluated data collected between 1985 and 2000. Groundwater nitrate concentrations measured on the Nipomo Mesa and within the Oso Flaco watershed were within water quality objectives. Groundwater nitrate concentrations in the Santa Maria Valley were elevated, with numerous sites consistently exceeding the water quality objective of 10 mg/L nitrate as N. Table 11 displays summary statistics for sites with elevated nitrate levels. Figure 15 displays all of the monitoring sites in the project area, and Figure 16 displays the names of sites in the lower Santa Maria Valley.

Table 11. Summary of nitrate-N concentrations in selected groundwater wells in the Santa Maria Valley

Monitoring site	Count (n)	Min. (mg/L)	Average (mg/L)	Max. (mg/L)	Sum > 10 mg/L
10N/34W-14E04 S	13	ND	11.7	17.8	10
10N/34W-14E05 S	9	ND	12.1	16.7	8
10N/34W-27L01 S	39	ND	6.4	15.4	7
10N/34W-35C01 S	32	1.8	8.1	12.8	6
10N/34W-32Q01 S	62	0.4	8.5	12.2	7
10N/34W-35P01 S	26	6.9	10.4	13.9	14
10N/34W-35P02 S	31	5.6	8.7	14.2	5

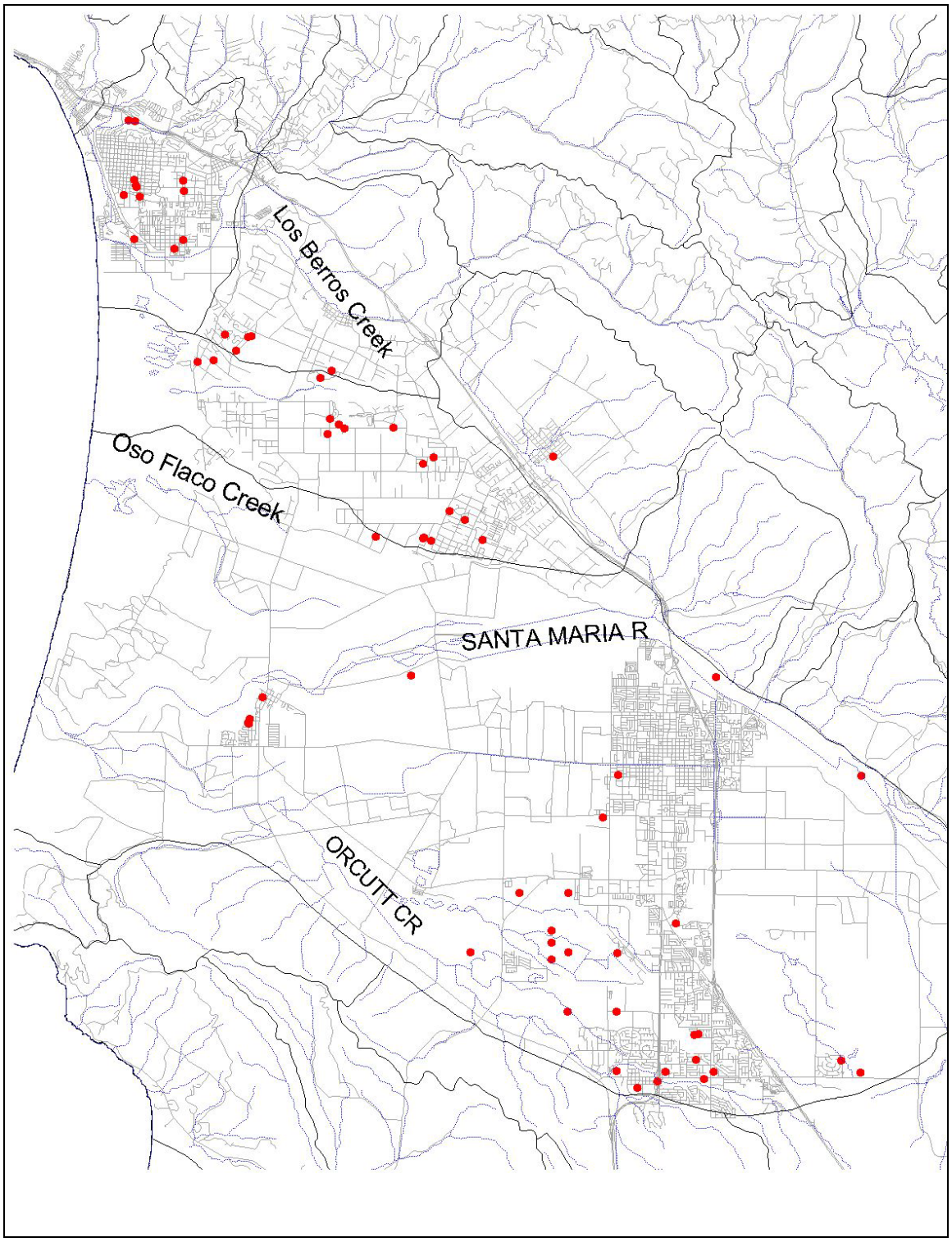

Figure 15. Groundwater Monitoring Sites in Santa Maria and Oso Flaco Watersheds

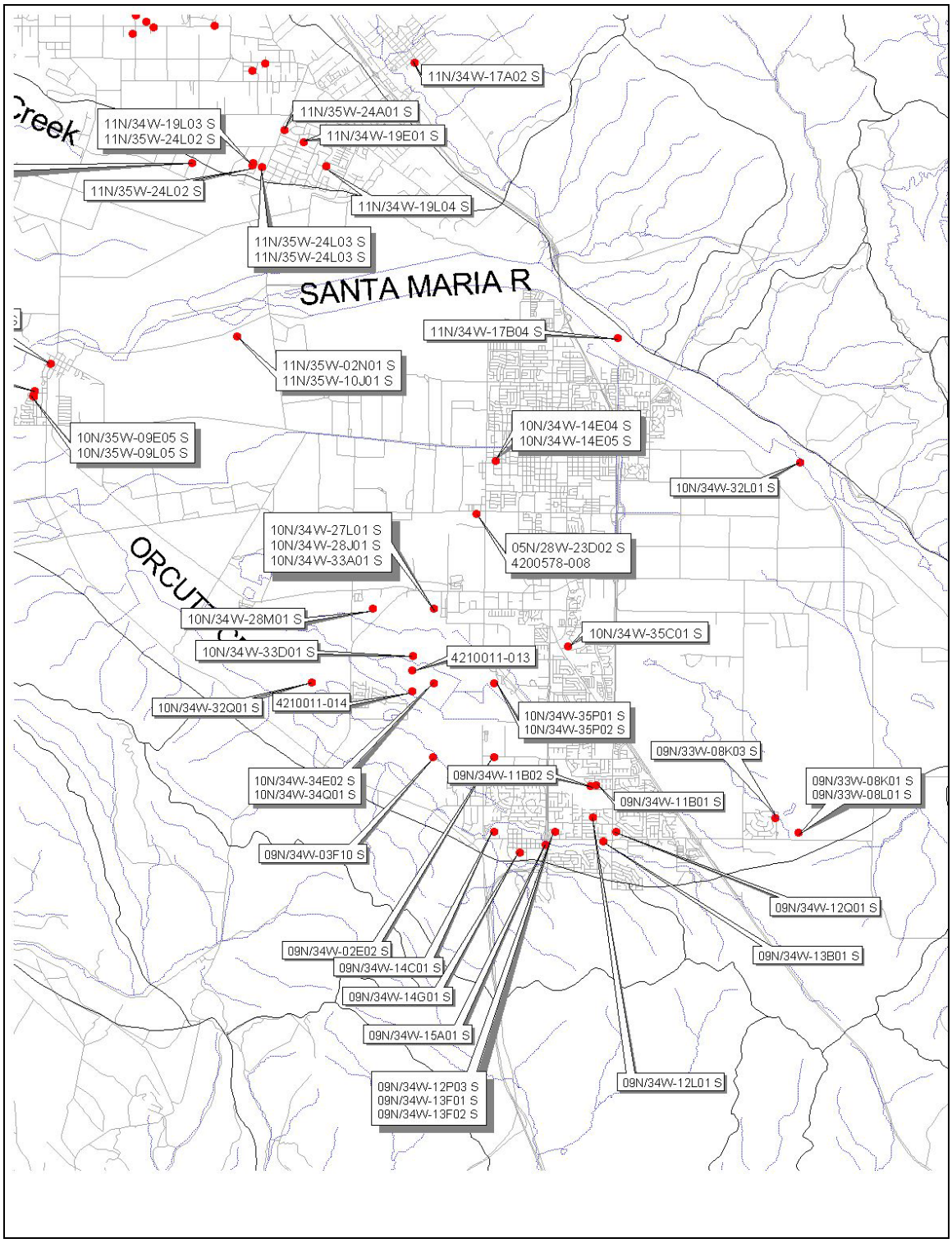

Figure 16. Groundwater Monitoring Sites in Lower Santa Maria Watershed.

4.1.12. Santa Maria Basin Oil Field Assessment

Komex Inc. prepared a report for the Water Board under the Santa Maria Basin – Oil Field Water Quality Assessment Project (the Project) in accordance with the National Fish and Wildlife Foundation (NFWF) Guadalupe Oil Field Settlement Water Quality Trust Grant. The project purpose was to perform a potential water resources impact assessment resulting from crude oil and natural gas production in the Santa Maria Valley.

As part of the project, Komex Inc. collected surface water samples during storm events and groundwater samples from existing monitoring wells and accessible private domestic water wells. Water Board staff reviewed the data collected and determined the following:

- All surface water samples collected during storm events were below the nitrate water quality objective, and
- Groundwater samples from monitoring wells: South of the Santa Maria River near Sisquoc, GW2 (29 mg/L), Southeast of the City of Santa Maria, GW6 (37 mg/L), Southwest of the City of Santa Maria, GW7 (12 mg/L), and East of Hwy 1 near Orcutt Solomon Creek, GW8 (22 mg/L) exceeded the nitrate water quality objective.

4.1.13. Santa Maria Oil Refinery

The ConocoPhillips (formerly Tosco) Santa Maria Oil Refinery is located on the Nipomo Mesa approximately 1 mile northeast of Oso Flaco Lake. The refinery discharges treated wastewater and storm runoff to the Pacific Ocean and is regulated under Waste Discharge Requirements**.** Water Board staff reviewed a compilation of site-wide groundwater monitoring data collected between 1996 and 2000 to determine if there are impacts to the listed water bodies from the refinery (e.g. landfarms, storage, disposal ponds, percolation ponds, sewer lines, stockpiles, process areas, septic system, coke piles, refinery derived landfills).

Water Board staff reviewed groundwater data collected in April 2000 and January 2001. Water Board staff found nitrate levels in groundwater taken from 9 of 19 monitoring wells in 2000 exceeded the drinking water quality objective; nitrate levels ranged from 0.53 to 22.8 mg/L as N. Water Board staff found that nitrate levels (as N) in groundwater were roughly 2-3 times higher upgradient (19.9 mg/L), in the center of the refinery (19-3 - 22.8 mg/L), and at the coke facility (22.5 mg/L), than elsewhere under the property. Water Board staff considered an upgradient site monitoring well (BC-1) background to the refinery. The monitoring well BC-1 had elevated levels of nitrate-N in 2000 (19.9 mg/L).

Water Board staff concluded that the groundwater nitrate concentrations at the refinery exceeded nitrate water quality objectives; however, the sources of elevated nitrate concentrations in groundwater were unknown. Additionally, the hydrologic influences from groundwater on the Nipomo Mesa to the listed water bodies within the Oso Flaco watershed were unknown. Water Board staff was uncertain whether or not refinery operations were a source of nitrate to groundwater –- or to the listed water bodies. Water Board staff will further evaluate the significance of refinery operations to the impairment of the Oso Flaco water bodies and include this in the Draft Project Report.

4.1.14. Agricultural groundwater and field runoff monitoring

In 2006, the CRCD, Southern San Luis Obispo and Santa Barbara Counties Agricultural Watershed Coalition (Watershed Coalition), and Water Board staff partnered to obtain data from groundwater used for irrigation and field runoff from agricultural lands. Quality assurance and control measures followed SWAMP and CCAMP standard operating procedures. The objectives of monitoring were as follows:

- To quantify the differences in nitrate concentrations between groundwater and field runoff from agricultural lands.
- To correlate these data collected with specific management practices, where possible; and
- To utilize these data in combination with the Cooperative Monitoring Program data and Central Coast Ambient Monitoring Program (CCAMP) data to better educate growers about water quality issues in the Santa Maria River and Oso Flaco watersheds.

Groundwater and runoff samples were taken from two irrigated agricultural fields. Specific samples were named by 1) 312 Hydrologic Unit Area, 2) sample type (ground water - GW, field runoff - FR) and 3) study site A or B (alphabetically) with the following site tags: 312GW-A, 312FR-A; 312GW-B, 312FR-B. The results of the effort are included in Table 12.

Table 12. Summary of nitrate-N concentrations in groundwater and field runoff on irrigated agricultural lands, March 2006.

SITE	Nitrate as N (mg/L)
312GW-A	32
312FR-A	47
312GW-B	27
312FR-B	25

Despite the limited measurements, Water Board staff concluded the following about runoff quality in comparison to the groundwater concentrations: nitrate concentrations (32 mg/L and 27 mg/L as N) in two groundwater samples exceeded the water quality objective; nitrate concentrations in field runoff from the two sites varied in comparison to groundwater concentrations with higher concentrations than groundwater at one site (47 mg/L) and lower at the other (25 mg/L).

4.1.15. Conditional Agricultural Waiver Program's Cooperative Monitoring Program

The Conditional Agricultural Waiver Program's Coordinated Monitoring Program (CMP) included monthly testing of nitrate and total ammonia, along with numerous other parameters. CMP sites included many existing CCAMP sites along with two additional sites (312BCC and 312GVS). Data are currently being processing for quality assurance purposes and will be included in the Draft Project Report.

4.2. Flow Data

The Santa Maria River is characterized by extremely low flows with episodic high flows. The United States Geological Survey (USGS), the County of Santa Barbara, CCAMP, and the CMP collected flow data in the project area.

The USGS collected data at numerous locations in the Santa Maria River. USGS mean monthly flow values are show in Figure 17. The Santa Barbara County Water Agency (SBCWA) also collects hydrologic data for use in numerical modeling to track and address regional water conservation strategies, and water use efficiency, water supply, and sedimentation into the County's water supply and storage facilities. Water Board staff will include the data in the Draft Report.

CCAMP staff began collecting flow at 312SMA in February 2005. Flow was also measured by the CMP. These data are currently being processing for quality assurance purposes. Water Board staff will include this additional data as it becomes available and include it in the Draft Report.

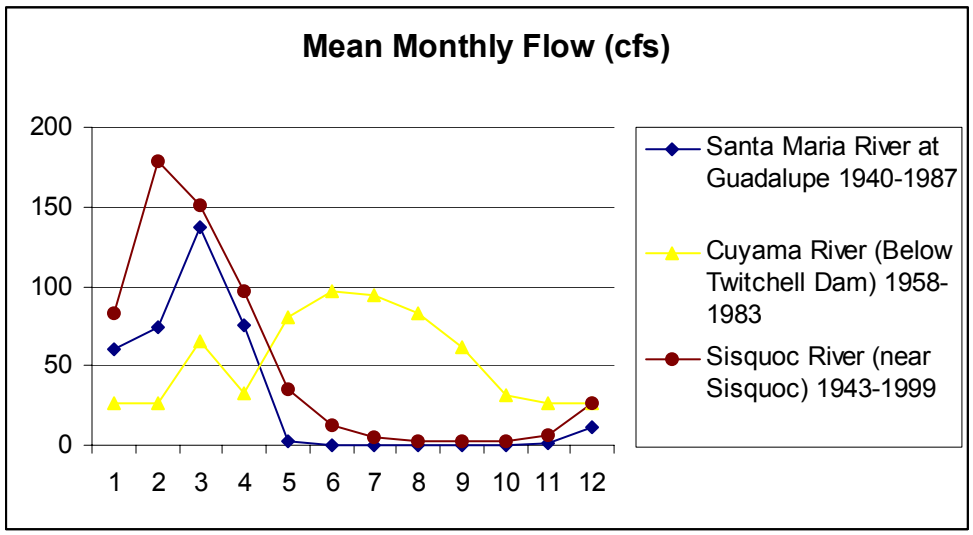

Figure 17. Flow (cfs) in the Santa Maria, Cuyama, and Sisquoc River Watersheds.

4.3. Land Use Data

Water Board staff considered the spatial data required for the following purposes to prepare this report: delineation of watershed boundaries; compilation of land use tables; preparation of orientation maps, and presentation of hydrologic and transportation networks. Water Board staff used watershed areas to describe the condition of the watershed and to interpret the relative effects of land use on nitrate and unionized ammonia levels. Water Board staff used USGS 30-meter Digital Elevation Models to determine sub-watershed boundaries for the listed water bodies. Water Board staff aggregated Multi-Resolution Land Characterization (MRLC) land use classifications into land use categories.

Water Board staff categorized land use classifications into several land uses. The categories included the following: agricultural (including irrigated lands), urban (including commercial, low density/rural residential) and open space (including rangeland).

Table 13 displays estimated land uses (acres and percent) by main watersheds and subwatersheds, including listed water bodies. The City of Santa Maria drains to numerous channels prior to entering the Santa Maria River. Water Board staff was unable to differentiate watershed drainage areas of the Main Street Canal from Blosser and Bradley Channels as they are supplied by a network of storm drains many of which are underground; as such, these are combined. Water Board staff estimated the residential area of the Nipomo Mesa that drains through a storm drain conveyance to Oso Flaco Creek.

Open space and agriculture remained the largest land uses despite continued development pressure from population growth. The Sisquoc and Cuyama water bodies were not listed as impaired (shown previously in Figure 1). According to Water Board staff's land use analysis, the Sisquoc and Cuyama watersheds were dominated by open space.

Water Board staff then used these land use classes in an export coefficient model. Estimated nitrate and ammonia loading rates are shown in Table 14. Table 15 contains a description of the land use classifications and the nitrate and ammonia export coefficient values that were used to estimate loads. Water Board staff calculated loading based on these export coefficients and land use information for each subwatershed.

Table 13. Estimated Land Uses (Acres and Percent) in and Loadings to Subwatersheds in the Oso Flaco and Santa Maria Watersheds.

Subwatershed Land Use Areas (acres)

Land Use	Entire Project Area	Sisquoc	Cuyama	Alamo Creek	Santa Maria River	Nipomo Creek	Channels (Blosser,	Bradley Canyon	Orcutt-Solomon	Santa Maria River Mouth	Oso Flaco Creek*
Agriculture	121,324	7,825	36,042	382	19,785	9,369	3,377	4,402	20,980	4	5,980
Open Space	668,169	293,219	636,190	57,413	24,433	4,444	1,267	6,248	31,013	1,160	2,843
Urban	18,255	763	1,155	2	1,253	688	4,692	365	5,576	2	228
Total Area	807,748	301,807	673,386	57,796	45,470	14,501	9,336	11,015	57,569	1,165	9,051
% Area by Subwatershed		37.4	83.4	7.2	5.6	1.8	1.2	1.4	7.1	0.1	1.1

Subwatershed Land Use (%)

Land Use	Entire Project Area	Sisquoc	Cuyama	Alamo Creek	Santa Maria River	Nipomo Creek	Channels (Blosser,	Bradley Canyon	Orcutt-Solomon	Santa Maria River Mouth	Oso Flaco Creek*
Agriculture	15.0	2.6	5.4	0.7	43.5	64.6	36.2	40.0	36.4	0.3	66.1
Open Space	82.7	97.2	94.5	99.3	53.7	30.6	13.6	56.7	53.9	99.5	31.4
Urban	2.3	0.3	0.2	0.0	2.8	4.7	50.3	3.3	9.7	0.2	2.5
Total %	100	100	100	100	100	100	100	100	100	100	100

Table 14. Estimated Nitrate and Ammonia Loads (lbs/ac/yr) from Subwatersheds in the Santa Maria and Oso Flaco Watersheds.

Subwatershed Loading (lbs. TN/yr)

Land Use	Entire Project Area	Sisquoc	Cuyama	Alamo Creek	Santa Maria River	Nipomo Creek	Channels (Blosser,	Bradley Canyon	Orcutt-Solomon	Santa Maria River Mouth	Oso Flaco Creek*
Agriculture	1,880,527	121,283	558,645	5,915	306,660	145,220	52,351	68,225	325,190	59	92,687
Open Space	962,163	422,235	916,113	82,675	35,183	6,399	1,824	8,997	44,659	1,670	4,094
Urban	100,770	4,213	6,374	9	6,914	3,797	25,899	2,016	30,780	11	1,256
Total Load	2,943,460	547,732	1,481,132	88,599	348,757	155,416	80,075	79,238	400,629	1,739	98,037
Load %	100	18.6	50.3	3.0	11.8	5.3	2.7	2.7	13.6	0.1	3.3
Load (lbs TN/ac/yr)	3.6	1.8	2.2	1.5	7.7	10.7	8.6	7.2	7.0	1.5	10.8

Subwatershed Loading (lbs. NH3/yr)

Land Use	Entire Project Area	Sisquoc	Cuyama	Alamo Creek	Santa Maria River	Nipomo Creek	Channels (Blosser,	Bradley Canyon	Orcutt-Solomon	Santa Maria River Mouth	Oso Flaco Creek*
Agriculture	308,164	19,875	91,546	969	50,253	23,797	8,579	11,180	53,289	10	15,189
Open Space	40,090	17,593	38,171	3,445	1,466	267	76	375	1,861	70	171
Urban	22,819	954	1,443	2	1,566	860	5,865	456	6,970	3	284
Total Load	371,073	38,422	131,160	4,416	53,284	24,924	14,520	12,011	62,120	82	15,644
Load %	100	10.4	35.3	1.2	14.4	6.7	3.9	3.2	16.7	0.0	4.2
Load (lbs TN/ac/yr)	0.5	0.1	0.2	0.1	1.2	1.7	1.6	1.1	1.1	0.1	1.7

Table 15. Land Use Classification and Nitrate Export Coefficient Values (lbs/ac/yr).

MRLC Land Use Description	Aggregated Land Use Class	SCCWRP * Nitrate	SCCWRP * Ammonia
Low Intensity Residential	Urban	5.52	1.25
High Intensity Residential	Urban	5.52	1.25
High Intensity Comm/Ind/Trans	Urban	5.52	1.25
Other Grasses (Urban/Rec; e.g. parks)	Urban	5.52	1.25
Open Water	Open Space	1.44	0.06
Bare Rock/Sand/Clay	Open Space	1.44	0.06
Quarries/Strip Mines/Gravel Pits	Open Space	1.44	0.06
Deciduous Forest	Open Space	1.44	0.06
Evergreen Forest	Open Space	1.44	0.06
Mixed Forest	Open Space	1.44	0.06
Deciduous Shrubland	Open Space	1.44	0.06
Grassland/Herbaceous	Open Space	1.44	0.06
Woody Wetlands	Open Space	1.44	0.06
Emergent Herbaceous Wetlands	Open Space	1.44	0.06
Planted/Cultivated (orch, vines, groves)	Agriculture	15.5	2.54
Row Crops	Agriculture	15.5	2.54
Small Grains	Agriculture	15.5	2.54
Pasture/Hay	Agriculture	15.5	2.54
Bare Soil	Agriculture	15.5	2.54

Notes: * Values (expressed as nitrate fluxes) contained in *Pollutant Mass Emissions to the Coastal Ocean of California: Initial Estimates and Recommendations to Improve Stormwater Emission Estimates*, Appendix C1-11, Southern California Coastal Water Research Project, Nov. 2000.

Water Board staff included the entire watershed area draining to the Santa Maria River in order to consider all of the contributing land uses to the lower watershed. In a loading analysis, Water Board staff concluded certain areas, particularly the Sisquoc and Cuyama subwatersheds, drained large open space areas and were not likely contributing excessive levels of nitrate and unionized ammonia. While open space appears to have contributed a large percentage of the load, it is because of the large area of open space. Water Board staff concluded this to be non-controllable and/or insignificant based on previous studies (e.g. National Monitoring Program, 2003). Water Board staff also concluded that the source of the impairment was confined to the lower reaches of the Santa Maria watershed, rather than to the entire watershed.

The Santa Maria River, Orcutt-Solomon Creek, and Oso Flaco Creek watersheds received loading primarily from irrigated agricultural areas. Water Board staff was unable to differentiate the drainage area boundary for the Main Street Canal from Blosser and Bradley Channels as part of the GIS analysis, but was able to determine that both agriculture and urban areas are contributing loads to the impaired water bodies.

Water Board staff could not draw conclusions from the GIS analysis as to the significance or the origin of the sources from rural residential land uses (e.g. manure from farm animals, failing individual septic systems). Water Board staff observed that numerous rural residential properties in the Santa Maria River watershed (e.g. Orcutt-

Solomon, Bradley Canyon) contained farm animals. Water Board staff will consider other areas with similar population and density of rural residential and try to determine the extent that these activities are occurring and contributing nitrate and ammonia in preparing the Draft Project Report.

Additionally, the GIS analysis did not provide information regarding point sources (e.g. WWTPs, refinery operations).

4.4. Data Analysis Summary

Water Board staff evaluated surface, groundwater, runoff, and effluent nitrate and ammonia data as part of numerous efforts to confirm impairment of the listed water bodies and further identify sources. Water Board staff also evaluated land use and flow information. Water Board staff concluded the following from the information presented above:

4.4.1. Seasonality

- The water bodies are characterized by extremely low flows and episodic high flows.
- Nitrate concentrations measured at the Main Street Canal, Orcutt-Solomon Creek, Oso Flaco Creek, and Little Oso Flaco Creek were elevated above water quality objectives year round.
- Nitrate concentrations along the Santa Maria River appeared to be higher during the dry season, although exceedances were found during every month of the year.
- Nitrate samples taken by the County of Santa Barbara (Project Clean Water) and by Komex Inc. from Orcutt-Solomon Creek and the Santa Maria River during storm events had concentrations less than the nitrate water quality objective.
- Unionized ammonia concentrations were elevated in the Santa Maria River upstream of the estuary, Bradley Canyon Creek, Blosser Channel, Main Street Canal, Orcutt-Solomon Creek, and Oso Flaco Creek above general water quality objectives year-round.

4.4.2. Water Body Segment Impairments

- Water bodies included or proposed for the 303(d) list were impaired, with a few exceptions described below.
- Water Board staff considers the most upstream site on Orcutt-Solomon Creek at Black Road (ORB), a low flowing drainage, as not impaired as it exhibited low nitrate and unionized ammonia levels year-round.
- Little Oso Flaco Creek is not specifically listed as impaired on the 303(d) list but was impaired for nitrate; Water Board staff will develop a nitrate TMDL for this water body.
- Oso Flaco Lake is on the 303(d) list, but is not designated as supporting the municipal use and as such, staff will not develop a nitrate TMDL for this water body unless numeric targets protective of aquatic life uses are warranted.
- Blosser Channel is not specifically listed as impaired on the 303(d) list but was impaired for unionized ammonia; Water Board staff will develop an unionized ammonia TMDL for this water body.

4.4.3. Water Quality Data Analysis

- Nitrate concentrations measured in storm water runoff from Prell and Hobbs Basins and the South Channel of Main Street did not exceed water quality objectives. Ammonia levels exceeded the objectives at Prell Basin and Main Street (North and South).
- In monthly samples taken between January 2000 and March 2001, nitrate concentrations in the Main Street Canal where it crosses under Main Street exceeded the water quality objective in eight of fourteen samples. This site received runoff from both urban and agricultural areas.
- Data collected monthly by CCAMP showed that eleven of sixteen samples collected between January 2000 and March 2001 had higher nitrate concentrations at 312SMI than at 312SMA. According to the SMEEP, nitrate concentrations in the Santa Maria River at Highway 1 were lower than samples collected from the estuary. CCAMP staff determined that concentrations at 312ORC, upstream of Orcutt Creek's confluence with the Santa Maria River correlated strongly with the concentrations at the Estuary site (312SMA). Both efforts found that nitrate concentrations in the estuary were likely due to substantial nutrient input from Orcutt-Solomon Creek.
- Unionized ammonia levels were above the general water quality objective in the Santa Maria River, Bradley Canyon Creek, Blosser Channel, Main Street Canal, Orcutt-Solomon Creek, and Oso Flaco Creek.
- Urban storm water from the rural residential area of Nipomo Mesa to Oso Flaco watershed did not exceed nitrate water quality objectives; runoff did not occur during dry periods.
- Samples taken from Oso Flaco Creek and Little Oso Flaco Creek exceeded nitrate water quality objectives, but were typically less than samples from unnamed agricultural ditches.
- Irrigated agricultural discharges to agricultural drains and listed water bodies occur during both wet and dry seasons.
- Effluent and groundwater concentrations measured by the City of Santa Maria as part of their wastewater treatment plant permit were below water quality objectives.
- Groundwater concentrations measured by the City of Guadalupe were below the water quality objective, with the exception of levels measured upgradient of the wastewater spray field, which rose dramatically in 1998.
- Groundwater concentrations measured downgradient of the Laguna County Sanitation District were typically below 10 mg/l nitrate as N. All effluent samples were below 10 mg/L with the exception of one sample collected in April 2003. Surface water samples collected in Orcutt-Solomon Creek were higher downgradient of the wastewater treatment plant than upgradient.
- Groundwater nitrate concentrations measured by DHS on the Nipomo Mesa and within the Oso Flaco watershed were within water quality objectives.
- Groundwater nitrate concentrations at the Santa Maria Oil Refinery exceeded nitrate water quality objectives; the impacts from the Refinery to surface water in the Oso Flaco watershed are unknown and as such Water Board staff will further evaluate to determine if the Refinery is source of impairment.
- Groundwater nitrate concentrations in the Santa Maria Valley were elevated, with seven wells consistently exceeding the nitrate water quality objective.

- Groundwater samples from monitoring wells near Orcutt-Solomon Creek exceeded the nitrate water quality objective.
- Nitrate concentrations in storm water samples taken from the Santa Maria Sanitary Landfill were below 10 mg/L nitrate, with the exception of one sample taken in 2004.
- Nitrate concentrations in two groundwater samples from agricultural irrigation wells exceeded the water quality objective. Nitrate concentrations in the two agricultural lands field runoff samples varied in comparison to groundwater concentrations with higher concentrations than irrigated groundwater at one site and lower concentrations at the other.

4.4.4. Land Use Analysis

- The Santa Maria River, Orcutt-Solomon Creek, and Oso Flaco Creek watersheds received nitrate and unionized ammonia loading primarily from irrigated agricultural areas.
- Both agriculture and urban areas contributed nitrate loads to the Main Street Canal and Bradley Channel, and unionized ammonia loads to Main Street Canal and Blosser Channel.
- Watersheds that were not impaired (e.g. Cuyama and Sisquoc) contained the largest open space (e.g. rangeland, shrub, forest) areas. Water Board staff considered the load from open space as non-controllable.
- Data indicated that rangeland areas did not contribute significant nitrate levels.
- Low density or rural residential land uses activities (manure from farm animals, failing individual septic systems) may have contributed to elevated nitrate and unionized ammonia levels, but the significance and origin of the sources were uncertain. As such, Water Board staff will further evaluate the significance of these activities as a source of impairment.

5. SOURCE ANALYSIS

The purpose of the Source Analysis is to identify sources and assist in allocating appropriate responsibility for actions needed to reduce loads from these sources. Water Board staff relied on information presented in the *Data Analysis* section and considered the following:

- Monitoring efforts to determine sources of nitrate and unionized ammonia,
- Relationships between seasonal conditions and pollutant levels,
- Connections between land use and pollutant concentrations,
- Connections between surface water and ground water, and
- Uncontrollable, natural sources.

This section provides information on the potential influence of land use activities on nitrate and unionized ammonia concentrations and the influence and uncertainty of degraded groundwater on surface waters.

Results of land use and data analyses indicated the primary sources in the project area were runoff from irrigated agriculture and urban lands. Water Board staff was uncertain as to the extent that rural residential properties were a source of impairment. While

information suggested this land use and associated activities to be a source, Water Board staff will further evaluate the significance. Staff was also uncertain as to the significance of the refinery operations to impairment in the Oso Flaco watershed and will further evaluate the information in preparation of the Draft Project Report.

Existing implementation efforts and regulatory mechanisms to address all the potential sources, along with activities that staff concluded were not sources are summarized below.

5.1. Potential Influence of Ground Water on Nitrate Concentrations

Groundwater nitrate concentrations in portions of the Santa Maria River watershed and other subwatersheds were substantially elevated, with numerous sites consistently exceeding the water quality objective. Irrigated agricultural growers often irrigate with groundwater that has elevated nitrate levels. Uncertainties were the origins (e.g. fertilizer, sewage) of the elevated nitrate levels throughout the project area. Furthermore, the impacts of the degraded groundwater to the listed water bodies were not fully understood.

5.2. Preliminary Source Analysis and Regulatory Mechanisms

5.1.1. Irrigated Agricultural Runoff

Irrigated agriculture in the project area included farming of numerous crops, such as, celery, broccoli, lettuce, and cauliflower. Drainage infrastructure for farm tail water runoff was comprised primarily of large ditches, which drained to the listed water bodies.

Water Board staff concluded that runoff from irrigated agriculture is a source of nitrates and ammonia. The Water Board regulates irrigated agriculture through the Conditional Waivers of Waste Discharge Requirements for Discharges from Irrigated Lands in the Central Coast Region (conditional waivers). The permit includes requirements for landowners and operators to implement nutrient control measures and monitoring.

5.1.2. Urban Runoff

Water Board staff concluded that urban runoff is a source of nitrates and ammonia. The Water Board will be regulating storm water discharges through adoption of Storm Water Management Plans that comply with the National Pollution Discharge Elimination System (NPDES) General Municipal Separate Storm Sewer System (MS4) Permit for several municipalities in the Santa Maria and Oso Flaco watersheds. The County of San Luis Obispo, the County of Santa Barbara, and the City of Santa Maria have not previously been required to obtain permit coverage. The County of Santa Barbara has recently obtained general permit coverage (NPDES Permit No. CAS000004, Order No. 2003-0005-DWQ). The General Permit requires the dischargers to develop and implement a Storm Water Management Plan/Program (including nutrient fertilizer management measures).

Several unincorporated areas of the watersheds will be covered in the permit. The County of San Luis Obispo permit will include the Nipomo Mesa and "old town" Nipomo. The County of Santa Barbara permit will include Orcutt. The City of Guadalupe drains to the Santa Maria River, but will not be covered by the first five-year term of the MS4 permit.

5.1.3. Individual Sewage Disposal Systems

Nitrate and ammonia can originate from failing individual sewage disposal systems. The Counties of San Luis Obispo and Santa Barbara regulate individual sewage disposal systems within the rural areas of the Santa Maria River and Oso Flaco watersheds. The Community of Nipomo is currently developing a Wastewater Master Plan.

Low density, or rural residential land uses are likely contributing to nitrate and unionized ammonia levels, but Water Board staff concluded the significance and origin of the source is not certain. Water Board staff will conduct additional investigations to better determine if this is a source or not. That information and conclusions will be included in the Draft Project Report.

5.1.4. Livestock

Nitrate and ammonia sources may include small livestock operations such as those for horses or chickens and other farm animals. Manure from small farming and rural residential facilities, if improperly managed, is a potential source as well.

Improper manure management on some properties in the project area may be contributing to nitrate and unionized ammonia levels, and Water Board staff concluded the significance and origin of the source is not certain. Water Board staff will further evaluate to better determine the significance of these activities in preparing the Draft Project Report.

5.1.5. WDR Permitted Facilities

The Water Board issues Waste Discharge Requirements (WDRs) for several facilities in the Santa Maria and Oso Flaco watersheds. Numerous facilities (e.g. onsite systems for schools, food processing plants) are permitted for discharge to land.

Several of the facilities in the Santa Maria watershed (City of Santa Maria, City of Guadalupe, Laguna County Sanitation District, and Nipomo Community Services District wastewater treatment plants) are authorized to discharge treated municipal wastewater to land where such discharges are likely to percolate to groundwater. Discharge of municipal wastewater to surface water bodies is prohibited. Each municipality is responsible for operation of the collection system. Dischargers will be developing collection system management plans during renewal of their permits.

Permitted discharges to surface waters include water supply discharges, fire hydrant testing, and vegetable cooling (ice melt), none of which are likely sources of nitrate loading to the listed water bodies.

Water Board staff concluded that neither the WWTPs nor the other WDR permitted facilities were significant sources of nitrate to the listed water bodies. Water Board staff will further evaluate the extent that the WWTPs are a source of ammonia impairment in preparing the Draft Project Report.

5.1.6. Industrial permitted facilities

The Santa Maria Oil Refinery is located on the Nipomo Mesa northeast of Oso Flaco Lake. Water Board staff evaluated available data and concluded that the groundwater nitrate concentrations at the refinery exceeded nitrate water quality objectives. Water Board staff was uncertain whether or not refinery operations are a source of nitrate to groundwater or to surface water, and will further evaluate in preparing the Draft Project Report.

Water Board staff evaluated nitrate storm water data collected at the Santa Maria Sanitary Landfill by the City of Santa Maria. Water Board staff concluded the landfill was not a significant source of nitrate to the Santa Maria River. Water Board staff will further evaluate the extent that the landfill is a source of ammonia impairment in preparing the Draft Project Report.

5.1.7. Rangeland

Water quality data indicated nitrate concentrations draining primarily rangeland do not contribute significant loads. Water Board staff concluded rangeland was not a significant source of nitrate in the listed water bodies. Water Board staff will further evaluate the extent that rangeland is a source of ammonia in preparing the Draft Project Report.

5.3. Source Analysis Summary

Water Board staff's preliminary conclusions were that the nitrate levels throughout the Santa Maria and Oso Flaco watersheds were elevated and vary by season. Unionized ammonia levels were elevated year-round in the impaired water bodies. Monitoring data and a land use analysis confirmed that nitrate and unionized ammonia was originating from multiple sources. Water Board staff concluded that the following sources were most likely to contribute to nitrate and unionized ammonia impairment of the listed water bodies, in decreasing order of contribution:

- Irrigated agricultural runoff
- Urban runoff

Water Board staff was uncertain as to the significance of low density/rural residential areas (failing individual sewage disposal systems and manure management for livestock) to the impairment. Additionally, Water Board staff concluded that the impacts from the Santa Maria Refinery to the Oso Flaco water bodies were unknown. As such, Water Board staff will further evaluate these sources to determine the best approaches in developing the TMDLs (e.g. request additional information, conduct additional investigations, include a larger Margin of Safety in the TMDLs).

Water Board staff concluded the following activities are not sources of nitrate to the listed water bodies:

- WWTPs and other facilities
- Santa Maria Sanitary Landfill
- Rangeland
- Open space

Water Board staff will further evaluate the significance of these activities to the ammonia impairment in the Santa Maria River watershed and characterize their contribution in the Draft Project Report.

6. CRITICAL CONDITIONS AND SEASONAL VARIATION

Water Board staff determined that there may be a pattern of seasonal variation at some water bodies based on the timing of values exceeding water quality objectives:

- Nitrate concentrations measured monthly at the Main Street Canal, Orcutt-Solomon Creek, Oso Flaco Creek, and Little Oso Flaco Creek were elevated above water quality objectives year round.
- Nitrate concentrations along the Santa Maria River, were higher during the dry season, although they exceed water quality objectives during every month of the year.
- Nitrate samples taken during storm events from Orcutt-Solomon Creek and the Santa Maria River had concentrations less than the nitrate water quality objective.
- Unionized ammonia levels were elevated year-round at the impaired sites.

Critical conditions for this project include the influence of weather and flow (irrigation and storm event driven), but the extent of the influence on nitrate and unionized ammonia concentrations in the listed water bodies is uncertain. Therefore, recommendations for this project apply during all seasons in order to address the most critical conditions.

7. TMDL CALCULATION AND ALLOCATIONS

A Total Maximum Daily Load (TMDL) is the loading capacity of a pollutant that a water body can accept while protecting beneficial uses. Usually, TMDLs are expressed as loads (mass of pollutant calculated from concentration multiplied by the volumetric flow rate), but in the case of nitrate or ammonia, it is more logical for the TMDLs to be based only on concentration. TMDLs can be expressed in terms of either mass per time, toxicity or other appropriate measure [40 CFR §130.2(I)]. A TMDL expressed as a concentration is logical for this situation because the risks (e.g. public health, aquatic life) associated with drinking water and/or toxicity not readily controlled on a mass basis. Therefore, Water Board staff proposes establishing TMDLs expressed as a concentration in the listed water bodies. The TMDLs are the same concentrations as were proposed in the numeric targets section. The TMDLs apply in all areas of the tributaries.

The proposed waste-load and load allocations for all *non-natural* sources are equal to the TMDL concentrations and focus on reducing or eliminating the controllable sources of nitrate and ammonia. These sources shall not discharge or release a "load" that will increase the load above the TMDL of the water body. Sources in all areas of the tributaries will be held to these allocations.

Water Board staff concluded at this time the following allocations are necessary to achieve water quality objectives:

- Load allocations of a maximum concentration of 10 mg/L for nitrate (as N) and a maximum concentration of 0.025 mg/L for unionized ammonia (NH_3) to owners and operators of irrigated agriculture.
- Waste load allocations of a maximum concentration of 10 mg/L for nitrate (as N) and a maximum concentration of 0.025 mg/L for unionized ammonia (NH_3) to municipalities for stormwater discharges.

Nitrate levels suitable for municipal drinking water supply may also be toxic to aquatic life. As such, Water Board staff will evaluate the appropriateness of including allocations for nitrate to meet the general water quality objective for toxicity and include in the Draft Project Report. Water Board staff will also evaluate whether surface water may be affecting the beneficial uses of groundwater and establish numeric targets for the surface water accordingly. Results of these evaluations will be included in the Draft Project Report.

Staff will also include any additional sources that require load and waste load allocations and numeric values for each in the Draft Project Report.

The allocation to background (including natural sources) is also the TMDL concentrations. The parties responsible for the allocation to controllable sources are not responsible for the allocation to natural sources. Additionally, there are activities and/or facilities that Water Board staff concluded were not sources causing impairment. Water Board staff is currently evaluating existing loads from these activities and/or facilities and will include these values in the Draft Project Report.

The TMDLs are considered achieved when the allocations assigned to the controllable and natural sources are met, or when the numeric targets are consistently met in all water bodies.

Should all control measures be in place and nitrate and ammonia levels remain high, investigations will take place to determine if the high levels are due to uncontrollable sources. Responsible parties may demonstrate controllable sources of nitrate and ammonia are not contributing to the impairment of water quality objectives in receiving waters. If this is the case, Water Board staff may consider re-evaluating the targets and allocations.

8. IMPLEMENTATION ALTERNATIVES

8.1. Introduction

The purpose of a TMDL Implementation Plan (Plan) is to describe the steps necessary to reduce loads and achieve the TMDLs. Water Board staff identified implementation alternatives that will likely be included in the Plan. This section includes potential implementation alternatives that Water Board staff expects would reduce nitrate and ammonia loading and the parties that would be responsible for taking these actions. Interim actions that could be taken during TMDL development are discussed. Water Board staff also identified a preliminary alternatives analysis. The Implementation Plan will ultimately include specific actions and a timeline to achieve the TMDLs.

8.2. Implementation Alternatives

Water Board staff recognized numerous existing efforts and regulatory mechanisms aimed at nitrate and unionized ammonia loading. These included, but are not limited to the following: farmers implementing irrigated agricultural management measures, rural landowners maintaining individual sewage disposal systems and implementing manure management measures for livestock wastes, and municipalities implementing storm water management measures. Additionally, the Santa Maria River Estuary Enhancement and Management Plan (March 2004) recommended management actions to improve water quality.

Water Board staff identified possible implementation actions or alternatives for sources (e.g. urban storm water, agriculture) that may be contributing to the impairment. Actions that address reductions from nonpoint sources must be consistent with the Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program (SWRCB, 2004). Potential implementation alternatives are described below.

Implementation actions and monitoring requirements are likely to rely on existing and proposed regulatory mechanisms. Water Board staff recommends the following actions be developed or modified as part of TMDL implementation to address loading:

- Comply with existing Conditional Waiver by developing and implementing nutrient-control management practices for irrigated agricultural lands and participate in the Cooperative Monitoring Program;
- Review, approve, and enforce implementation of nitrate and ammonia reduction management measures in Storm Water Management Plans for the City of Santa Maria and the Counties of Santa Barbara and San Luis Obispo;
- Implement Nonpoint Source (NPS) control programs for the City of Guadalupe to reduce storm water runoff and comply with the NPS Policy;
- Request that local (e.g. County, City, Community Services Districts, etc…) submit a proposal to establish “onsite wastewater management districts” to evaluate needs for upgrades, connections to sewer system, conduct inspections, monitoring and reporting;
- Implement NPS control implementation programs (e.g. photo-documenting management measures) for farm animal and livestock facilities on rural residential land uses, as part of WDRs, waivers, or prohibitions to comply with NPS Policy; and

- Update wastewater treatment plant permits to include collection system management plans during permit renewal.

If the TMDL Implementation Plan consists of multiple Water Board actions, then staff will propose the TMDLs as a Basin Plan Amendment. Water Board staff will evaluate these approaches and describe what will be required in the Draft Project Report.

8.3. TMDL Development Recommendations

Water Board staff identified an action that could be taken pro-actively during TMDL development. If this action is not taken prior to TMDL adoption, it may be required through modifications to existing regulatory mechanisms or new regulatory mechanisms.

- Water Board staff request that the Santa Maria refinery monitor and report on groundwater conditions and discharges to determine if there are any impacts to the impaired water bodies in the Oso Flaco watershed.
- Water Board staff will further evaluate the significance of several sources (e.g. from individual septic systems) of nitrate and ammonia to the water bodies.

8.4. Preliminary Alternatives Analysis

Water Board staff will be conducting a California Environmental Quality Act (CEQA) scoping meeting in December 2006 to identify environmental impacts. The Water Board is required to undergo a certified regulatory process, by identifying adverse impacts to the environment in a subsequent environmental document. To facilitate a discussion at the scoping meeting to best identify all impacts, Water Board staff identified some potential environmental impacts from various foreseeable methods of compliance (management measures). These are discussed below. Water Board staff will modify these based on input from the public.

8.4.1. Environmental impacts from no action (no TMDL)

Existing and future efforts by municipalities and owners and operators of irrigated lands to comply with existing storm water requirements and the Conditional Waiver (implementation of fertilizer and irrigation management measures) may be sufficient to achieve the TMDL. The environmental impacts from various foreseeable methods of compliance are the same as those identified below for these lands.

There are currently no formal requirements of rural landowners regarding livestock to achieve the TMDLs. This would result in no additional reductions from rural residential lands. The environmental impacts from implementing additional activities or various foreseeable methods of compliance are identified below for these lands.

8.4.2. Environmental impacts from urban management measures

The environmental impacts of various foreseeable methods of compliance from urban areas (education and outreach regarding fertilizer reduction/management on landscapes, planting of drought-tolerant species, use of pervious surfaces, water conservation, etc…) are insignificant.

8.4.3. Environmental impacts from irrigated agricultural measures

The environmental impacts of various foreseeable methods of compliance from agricultural areas (nutrient-reduction management, irrigation water quality testing, irrigation efficiency, couture cropping, cover-cropping, etc…) are insignificant.

8.4.4. Environmental impacts from rural management measures

The environmental impacts of various foreseeable methods of compliance from low density, or rural residential areas (septic tank maintenance, connection to sewer-system, manure management from livestock, etc…) are insignificant. Connection to a sewer-system and/or construction of a future system would cause significant temporary impacts. This is not currently proposed, however; as leaking and/or failing septic tanks were not a primary source of impairment.

8.4.5. Environmental impacts from refinery operations

The environmental impacts of various foreseeable methods of compliance from the refinery operations are insignificant.

8.4.6. Environmental impacts from alternative waste and load allocations

Water Board staff could require *only* urban or *only* agriculture to reduce loading. This alternative; however, would not achieve the TMDLs. Furthermore, these lands are regulated under existing programs. Additionally, because the environmental impacts from implementing methods of compliance are insignificant, this alternative would also result in insignificant impacts.

9. PUBLIC PARTICIPATION

In 2006, Water Board staff began developing a Stakeholder Plan for this project. Water Board staff anticipated a low-medium to medium level stakeholder involvement, as identified in the Process for Addressing Impaired Waters in California (June 2005). Water Board staff based this determination on the fact that there are few competing interests; committed, formal stakeholder groups; local implementation and monitoring; and adequate time in the schedule. Opportunities for interested party involvement include: providing data and other information to Water Board staff, and providing review and comment on the Preliminary Project Report, Project Report, and Regulatory Action Plan (i.e. Basin Plan Amendments).

The primary framework for stakeholder involvement to date has been communication via email and telephone, Water Board staff participation in an existing group's meetings (e.g. farm water quality short-course) and focused meetings to request specific information (e.g. water quality data) or to answer specific questions (e.g. regarding implementation approaches).

On September 30, 2004, Water Board staff provided an update of proposed TMDLs to the Farm Water Quality Short Course. On March 28, 2006 Water Board staff met with agricultural community members to better inform the Southern San Luis Obispo County Agricultural Watershed Coalition regarding TMDL development and implementation options.

Water Board staff emailed a status to numerous stakeholders, and has had informal correspondence with several key stakeholders in the Counties. Water Board staff provided another update during a face-to-face meeting with growers on August 29, 2006.

Water Board staff will be notifying stakeholders to communicate project status, expectations, request input and gain any additional relevant information; and answer any questions. Water Board staff will request review and comments on this report as to whether the data analyses for the TMDL components include all available data and information and support the conclusions drawn, along with input and ideas on implementation strategies.

10. PROJECT MANAGEMENT

In October 2006, Water Board staff concluded that the most efficient and effective way to address the proposed ammonia listings was to incorporate them into the existing nitrate project. If further evaluation of the ammonia sources results in substantial project delays, then staff will consider addressing the impairments separately.

The State's Guidance for addressing impaired waters (Process for Addressing Impaired Waters in California, June 2005) describes and allows for 8 phases (Project Definition, Project Planning, Data Collection, Project Analyses, Regulatory Action Selection, Regulatory Process, Approval, and Implementation). This project is currently in Phase Four, Project Analyses, which ends with the completion of this document, the Preliminary Project Report. Water Board staff is holding a CEQA meeting to identify environmental impacts and provide project status in December 2006. In Phase Five, Water Board staff will pursue additional work identified in this report, and incorporate comments from stakeholders into the next deliverable, a Draft Project Report due in April 2007. Water Board staff will then circulate that document for review.

At this time staff anticipates completing all tasks, preparing all reports on time and within allocated resources according to the Water Board's TMDL Program Workplan for Fiscal Year 2006-2007, unless further evaluations require more effort than planned. Staff's approach to further investigations includes field surveys, and evaluating additional existing data and information. The nitrate and ammonia TMDLs are scheduled to be adopted in 2008.